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The Measurement of Human Capital in the U.S. Economy

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The Measurement of Human Capital in the U.S. Economy*

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Abstract

This paper develops a new approach to measuring human capital that permits the distinction of both observable and unobservable dimensions of skill. In doing so, we rely on a new large-scale, employer-employee data set containing information on some 68 million individuals and 3.6 million firms. Unlike previous studies that focus solely on observable characteristics such as education and experience, we explain a very large proportion (84%) of the total variation in wages. While the wage distribution remained largely unchanged between 1992-1997, we document a pronounced right shift in the overall distribution of human capital. Most workers entering our sample, while less experienced, were otherwise more highly skilled, a difference which can be attributed almost exclusively to unobservables. Nevertheless, compared to exiters and continuers, entrants exhibited a greater tendency to match to firms paying below average internal wages. Firms reduced employment shares of low skilled workers in virtually every industry. As such, our results strongly suggest the distribution of human capital will continue to shift to the right, most likely at an accelerated rate.

Keywords: human capital, employer-employee data, fixed effects

JEL Codes: J24, J31, C23, C63, C81

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1 Background and Motivation

The study of wage determination is replete with analyses measuring the labor market return to observable worker characteristics like education and experience. These characteristics are generally held to embody the human capital used in the productive activities of businesses, as first formalized by Becker (1993) and Mincer (1974), and have since been used by labor economists to shed light on numerous debates, among them rising wage inequality, and gender and race-based wage differentials. Macroeconomists have also long been concerned with the proper valuation of human capital, most often for studying its contribution to economic growth (Jorgenson, Gollop, and Fraumeni 1987). Towards this end, researchers often measure wage differences across gender, experience, and education groups, before aggregating them to economy wide levels.

Unfortunately, research in both fields has suffered from an inability to explain large portions of the total variation in wages. Indeed, recent work on wage inequality (Juhn, Murphy, and Pierce 1992) and school quality (Aaronson and Sullivan 2001; Card and Krueger 1992) have helped focus attention on the importance of unobserved dimensions of skill. By relying almost exclusively on household data, researchers also continue to confound firm specific wage factors with person specific ones. Thus, to the extent that workers and firms match non-randomly, estimates of the returns to experience and education may be inconsistent (Abowd, Kramarz, and Margolis 1999; Groshen 1991). Finally, while labor reallocation at the firm level has been shown to impact aggregate productivity (Haltiwanger, Foster, and Krizan 2001), researchers have not yet been able to study firm level distributions of human capital in the U.S., at least on a wide scale.

In this paper, we propose a new approach for measuring human capital that permits the distinction of both observable and unobservable dimensions of skill. To do so we rely on data recently assembled at the U.S. Census Bureau by the Longitudinal Employer-Household Dynamics Program (LEHD) and comprised of universe earnings files from state unemployment wage insurance (UI) records collected in seven states during the 1990s. Our analysis sample contains information on over 68 million individuals and 3.6 million firms, or approximately 60% of the United States workforce. We also obtain supplementary information on the characteristics of both workers and firms through links to Census administrative files, thereby overcoming one of the primary shortcomings of previous work using UI data.[1] Our skill index builds directly from Abowd, Kramarz, and Margolis (1999, hereafter AKM) in using mobility of workers across firms to distinguish the market valuation of all person specific characteristics from the compensation policies of employers. The former combine to yield our measure of human capital, which can be thought of as capturing general human capital. Some of these components, like labor market experience, are observable and evolve over time, while others like education, race, and gender are similarly observable but time-invariant. While a host of other factors undoubtedly contribute to the remaining "unobservable" component,

[1] See Jacobson, Lalonde, and Sullivan (1993) for an excellent discussion of the relative merits of UI data.

they cannot be separately identified. However, their collective sum receives a labor market valuation that our estimation approach permits us to measure.

While not without limitations, we believe our approach represents considerable value added over previous attempts to measure human capital. Most notably, by simultaneously estimating person and firm fixed effects for all workers and firms in our data, we succeed in explaining a much larger proportion of the total variation in wages–84% to be exact– than could otherwise have been obtained. The resulting parameter estimates should also be free from any omitted variables bias stemming from non-random matching of workers and firms. While some of the person specific wage components we estimate can be explained by education, experience, sex, and race, the overwhelming majority cannot. Thus, measures based solely on the "usual suspects" may fail to paint as comprehensive a picture of the distribution of human capital as thought previously. We use our human capital measure to characterize the distribution of human capital, first for all workers in the economy, and then by looking within firms, where we decompose the labor input into total employment and the firm level distribution of human capital. The latter approach makes use of a smoothed, optimized bandwidth kernel density estimator.

We document a pronounced right shift in the overall distribution of human capital over the five year period of 1992-1997. This is due to an even larger shift for labor market continuers, due to increased labor market experience, being offset slightly by a net reduction in human capital from entry and exit. Even so, while workers who exit our sample tend to be highly experienced, when we consider the unobservable component of wages, they appear much less skilled than both entrants and continuers alike. In contrast, a large proportion of entrants, while less experienced, were otherwise more highly skilled than both exiters and continuers. These facts suggest that as entrants accumulate labor market experience the overall distribution of human capital will continue to shift to the right, most likely at an accelerated pace. By contrast, the overall wage distribution remained largely unchanged over the same period. This reflects the tendency of labor force entrants to match to firms with below average internal wages, and of continuers to match to firms with above average internal wages, thereby exacerbating pre-existing wage differences. This differential sorting pattern occurs both within and across industries, meaning entrants' higher propensity to work in low wage sectors like Retail trade and Services cannot be entirely to blame.

Looking at the human capital distributions for firms, the general pattern which emerges is of a greater tendency to employ workers at the ends of the human capital distribution rather than the middle. Heterogeneity in the human capital distribution of firms within the same industry is similarly U-shaped, reflecting greater variation among the extreme values of human capital than in the middle of the distribution. Between 1992 and 1997, between firm variation in the employment shares of low skilled workers declined, while the average firm in virtually every industry upskilled considerably. Employment shares in the bottom two skill deciles fell by 7.7% and 5.2% respectively but increased by 6% in each of the two highest skill deciles. Some of this trend is the result of surviving firms reducing employment

shares of low skill workers and increasing employment shares of high skill workers. However, entering firms tend to employ higher skilled workforces than both exiting and continuing firms.

The paper proceeds as follows. In Section 2, we develop a framework for conceptualizing firm level distributions of human capital, followed in Section 3 with additional discussion of the skill index used throughout the paper. Section 4 provides an overview of the LEHD data, discussing the creation of all analysis variables, most notably a full-time, full year earnings measure, which we call the "annualized" wage. We then compare our sample means to similarly constructed data from the March CPS, showing how a subset of individuals in both data sets can be connected to form a matched CPS-LEHD data set. Section 5 discusses identification and estimation of individual human capital. Since the tremendous scale of the data render estimation with the entire pooled data set infeasible, we develop an approach to adjust human capital measures derived separately for each state, in order to make them fully comparable. Section 6 presents the results of implementing this adjustment procedure, and makes comparisons between our human capital measure and more traditional measures. We then study how the distribution of wages, wage components, and human capital evolved between 1992 and 1997, highlighting the important role played by worker entry and exit. Section 7 builds firm level measures of the distribution of human capital and shows characterizes their evolution over the same period. Section 8 concludes.

2 Measuring the General Human Capital Input

In order to deliver on the promise of linked, longitudinal data associating employees with their employers, we need a conceptual framework that suggests the statistics one might estimate and the methods one might use to perform inter-temporal and inter-industry comparisons. We propose a method that decomposes the labor input into both total employment and the distribution of total employment according to our human capital (skill) index, h.

Consider a firm j at date t that combines its human capital, $f_{jt}(h)$, and physical capital, K_{jt}, inputs according to the production function

$$Q_{jt} = Q(f_{jt}(h), K_{jt}) \tag{1}$$

where $f_{jt}(h)$ is the unnormalized density function of employees with characteristics $h \in \Omega(\omega)$, h may be vector-valued, and $\Omega(\omega)$ is closed and bounded. Total employment is

$$L_{jt} = \int f_{jt}(h)dh. \tag{2}$$

Total labor cost is

$$W = \int w(h+z)f(h)dh, \tag{3}$$

where the wage rate is indexed by h, and z is a component representing firm-specific wage factors. A profit-maximizing competitive firm facing product price p_{jt} chooses $f_{jt}(h)$ to maximize

$$\pi = pQ - W. \tag{4}$$

The first order condition is

$$0 = p_{jt}\frac{\partial Q}{\partial f_{jt}(h_0)} - w_{jt}(h_0 + z_j),\ h_0 \in \Omega(\omega). \tag{5}$$

Suppose that h is a scalar and $\Omega(\omega) = [\underline{H}, \overline{H}]$. Then, a firm's total labor input is

$$L_{jt} = \int_{\underline{H}}^{\overline{H}} f_{jt}(h)dh = F_{jt}(\overline{H}), \tag{6}$$

where $F_{jt}(h)$ is the unnormalized cumulative distribution function associated with $f_{jt}(h)$. Define the normalized cumulative distribution of worker human capital as

$$G_{jt}(h) = \frac{F_{jt}(h)}{L_{jt}} \tag{7}$$

and the normalized density of worker types as

$$g_{jt}(h) = \frac{f_{jt}(h)}{L_{jt}}. \tag{8}$$

Let i index employees. The human capital (skill) indices of the observed employees can be represented by the set $\{\widehat{h}_{1jt}, \widehat{h}_{2jt}, ..., \widehat{h}_{L_{jt}jt}\}$ where the first subscript refers to an individual employee. We partition the support of h into L_{jt} intervals $(h_{0jt}, h_{1jt}], ..., (h_{L_{jt-1}jt}, h_{L_{jt}jt}]$ surrounding these values with $h_0 = \underline{H}$, $s_{L_{jt}} = \overline{H}$, and

$$h_{ijt} = \frac{1}{2}(\widehat{h}_{ijt} + \widehat{h}_{i+1jt}). \tag{9}$$

We estimate $g_{jt}(h)$ using $\widehat{g}_{jt}(h)$, a continuous, smooth, nonparametric estimator of $g_{jt}(h)$ and

$$\widehat{G}_{jt}(h) = \int_{\underline{H}}^{h} \widehat{g}_{jt}(t)dt. \tag{10}$$

These definitions permit us to estimate the each individual's contribution to the human capital distribution within the firm as $L_{jt}(\widehat{G}_{jt}(h_{ijt}) - \widehat{G}_{jt}(h_{i-1jt}))$. Thus, we are able to distinguish among work forces with the same level of employment by associating those work forces with differing human capital stocks.

Our empirical goal is to measure h and z using a wage equation which can distinguish between individual and firm effects. We will then estimate $g_j(h)$ for each firm using the actual characteristics of its employees. Finally, we use the estimated $\widehat{g}_{jt}(h)$and the components of the wage function to characterize differences among firms within and between 2-digit industries.

3 Construction of a Skill Index by Decomposition of the Wage Rate

Following AKM, we represent each individual's real full-time, full-year wage rate as

$$\ln w_{ijt} = \lambda + x_{it}\beta + \theta_i + \psi_j + \varepsilon_{ijt} \tag{11}$$

where θ_i is the individual effect, $x_{it}\beta$ is the effect of time-varying personal characteristics, ψ_j is the firm effect, λ is the intercept, and ε_{ijt} is the statistical residual.[2] The log wage rate $\ln w_{ijt}$ is the natural log of the real annualized wage at each individual's dominant employer. Only years in which individuals are full-time employees have been included in the analysis. The x_{it} variables include labor force experience (through a quartic), time effects, and a series of indicator variables reflecting the kind of work history used to form the dependent variable, all interacted with sex. We also decompose the overall individual effect as

$$\theta_i = \alpha_i + u_i\eta, \tag{12}$$

where $u_i\eta$ is a part associated with observable, non time-varying characteristics such as sex, education and race, and α_i is the part due to unobservables. While a more detailed discussion of identification and estimation strategies is deferred until Section 4, we estimate equation (11) using the full least squares solution as implemented at the U.S. Census Bureau by the LEHD Program.

Viewed in this light, a worker's wage is the sum of the market valuation of her personal characteristics (the external wage) and the specific compensation policies chosen by her employer (the internal wage). Some personal characteristics, like labor market experience, evolve over time while others, like education, race, gender, and unobserved "ability," remain constant. Stochastic changes to these so called "person effects" and "firm effects" are ignored and are thus essentially smoothed out over the sample period. In the language of AKM, high wage workers are those workers for whom the person specific components of wages are above average. In contrast, high wage firms are employers who set the internal wage shared by all their employees above the economy wide average. Such a phenomenon could be the result of efficiency wage setting due to monitoring or incentive considerations, union bargaining power, or rent sharing in firms with persistently above normal profits. It could also reflect wage premia from capital-skill complementarities in capital intensive firms. To the extent there is sorting between workers and firms, for instance if high wage workers match to high wage firms, estimates of the parameters in equation (11) will be biased unless researchers control for both person and firm heterogeneity.[3]

[2] While we have not used the AKM notation denoting each firm j as $J(i,t)$, the data are constructed according to the same design. Thus, an individual is recorded as employed for the dominant firm only and there is only one observation for each (i,t) pair.

[3] See AKM for a formal derivation of the bias that results from ignoring person or firm heterogeneity when estimating equation (11).

In what follows, we combine the person fixed effect θ_i with the experience component of $x_{it}\beta$ and a reference constant δ to form our measure of human capital, a measure which we call "h"

$$h_{it} = \delta + \theta_i + x_{it}^{\exp}\beta^{\exp} \tag{13}$$

The skill index can therefore be constructed directly from the parameter estimates in equation (11) and should be interpreted as a measure of general human capital. In other words, h_{it} contains all characteristics of the individual that are compensated by the labor market. This includes the so-called "usual suspects" like experience, education, sex, and race but also a host of other factors which remain unobserved to the econometrician like innate ability, educational quality, social capital, and effort. While we will not speculate further as to what these factors might be, their collective sum does receive a labor market valuation that our estimation approach permits us to identify. We believe such information should not be ignored when measuring human capital, and show below that its inclusion helps reveals several recent trends which would otherwise not have been detected.

Our empirical human capital index is therefore the value of the predicted annualized full-time log wage rate based solely on the individual's measured and unmeasured characteristics. Throughout much of the paper we also examine these components separately as they clearly represent different dimensions of worker skill. As noted above, we are able to generate estimates of h_{it} for all 68 million workers in our data set. We can therefore trace the evolution of the entire distribution of human capital in the collective economies of seven states during the 1990s. Furthermore, because we can place all of these workers inside their firms, we can also study how the human capital distributions within firms and industries changed during the same period.

4 Construction of the Data

4.1 Individual Records and Employment Histories

As discussed above, we utilize the LEHD Program's Employment Dynamics Estimates database which is described briefly below. See Abowd, Lane, and Prevost (2000) and Vilhuber (2002b) for more detailed discussions. When a variable was created with an exact link to another database, we use the actual value from that data source. When a variable was created with a statistical link to another database, we impute the value of the variable 10 times, thereby providing information on the precision of the statistical links.[4] The individual data were derived from the universe of unemployment insurance (UI) quarterly wage records from seven states: California, Florida, Illinois, Maryland, Minnesota, North Carolina, and Texas. The *BLS Handbook of Methods* (1997) describes UI coverage as "broad and basically

[4]This approach is detailed at length in Rubin (1987). This draft contains no statistics using the additional imputations.

comparable from state to state," and claims over 96 percent of total wage and salary civilian jobs were covered in 1994. The Federal Unemployment Tax Act (FUTA), first enacted in 1938, lays the ground rules for the kinds of employment which must be covered in state unemployment insurance laws. While technically mandating coverage of all employers with one or more employees in a calendar year, FUTA allows for numerous exceptions to covered employment (Stevens 2000). These include workers at small agricultural co-operatives, employees of the Federal government, and certain employees of state governments, most notably elected officials, members of the judiciary, and emergency workers. According to the *Handbook*, UI wage records measure "gross wages and salaries, bonuses, stock options, tips, and other gratuities, and the value of meals and lodging, where supplied." They do not include OASDI, health insurance, workers compensation, unemployment insurance, and private pension and welfare funds.

Individuals are uniquely identified and followed for all quarters in which their employers had reporting requirements in the UI system. Thus, cross-state mobility can be observed for individuals moving between any of the seven states for which we have data. Although coverage dates vary, all states provide between four and ten years of data throughout the 1990s.[5] Table 1 details the coverage dates and number of individuals appearing in each of these states. By combining them into a single "pooled" file, we have information on approximately 68 million workers, accounting for over 60% of the U.S. workforce. Using Census Bureau and other LEHD data bases, sex, race, date of birth, and education are combined with the individual earnings data.[6] Upon each individual's first appearance in the data, we calculate labor force experience as potential labor force experience (age - education - 6). In subsequent periods, experience is measured as the sum of observed experience and initial (potential) experience.

The UI wage records connect individuals to every employer from which they received wages in any quarter of a given calendar year. We therefore construct individual employment histories using the same personal identifier used in the individual data. Employers are identified by their state unemployment insurance account number (SEIN). While large employers undoubtedly operate in multiple states, their SEINs are unfortunately state specific, meaning they cannot be connected.[7] In addition, while we match workers to their employers, it is not possible to connect those employed in firms with multiple establishments to specific places of work. This problem is not overly pervasive, as over 70% of employment occurs in firms with only a single establishment. Table 1 shows the number of SEINs that appear in

[5] Only Maryland provides data from the 1980s.

[6] Sex, race, and date of birth are based on an exact match to adminstrative data. Education is based on a statistical match.

[7] Technically, this problem can be largely overcome by linking our UI data to the Census Business Register. Such a link, however, requires a cross-walk between the SEINs on the UI data and the Federal employer identifiers on the Business Register. Cross-walks have not yet been made available for all seven states under consideration.

each of the seven states. In total, we identify over 3.6 million SEINs.[8]

For every year an individual appears in a state, we identify a "dominant" employer–the employer for whom the sum of quarterly earnings is the highest–in order to better approximate the individual's full-time, full-year annual wage rate using the following steps. First, define full quarter employment in quarter t as having an employment history with positive earnings for quarters $t-1$, t , and $t+1$. Continuous employment during quarter t means having an employment history with positive earnings for either $t-1$ and t or t and $t+1$. Employment spells that are neither full quarter nor continuous are designated discontinuous. If the individual was full quarter employed for at least one quarter at the dominant employer, the annualized wage is computed as 4 times average full quarter earnings at that employer (total full quarter earnings divided by the number of full quarters worked). This accounts for 84% of the person-year-state observations in our eventual analysis sample. Otherwise, if the individual was continuously employed for at least one quarter at the dominant employer, the annualized wage is average earnings in all continuous quarters of employment at the dominant employer multiplied by 8 (i.e., 4 quarters divided by an expected employment duration during the continuous quarters of 0.5). This accounts for 11% of all observations. For the remaining 5%, annualized wages are average earnings in each quarter multiplied by 12 (i.e., 4 quarters divided by an expected employment duration during discontinuous quarters of 0.33).

4.2 Analysis Sample and Summary Statistics

We restrict our analysis sample to individuals aged 18-70, employed full-time at their dominant employer.[9] Table 2 presents sample means for several earnings, demographic, industry, and labor force attachment variables for the period 1990-2000. We also contrast our analysis sample with the base (unrestricted) file as well as a sample imposing the dominant employer restriction but not the full-time status restriction. The final analysis sample contains 287 million person-year-state observations for the aforementioned 68 million individuals and 3.6 million firms. In comparison to the base LEHD file, our analysis file has considerably higher wages and earnings, and is slightly more educated, male, white, and experienced. Fifty percent of observations are from individuals who worked four full quarters during the year. As mentioned earlier, only five percent are from discontinuous employment spells. A mean annualized wage of $38,710 (1994 dollars) reflects the average value of what individuals *would* have earned at their dominant had they worked full-time for the entire year. Sixty five percent of the sample was employed in either Services (34%), Manufacturing (16%), or

[8]Prior to any of the empirical work discussed above, job history, earnings, and name information are used to correct miscoded person identifiers (Vilhuber 2002a). All person identifiers are subsequently annonymized. Similarly, attempts are made to correct administrative changes in the SEINs by studying large cross "firm" movements of workers (McKinney 2002).

[9]Full time status is assigned using a statistical link to the Current Population Survey.

Retail Trade (15%).

For purposes of comparison, Table 3 presents summary statistics from the Census internal March Current Population Survey (CPS) over the same time period.[10] As in Table 2, the first three columns show how these statistics change as one moves from the unrestricted, pooled CPS (all states) to a sample with approximately the same restrictions imposed on the LEHD analysis sample. Columns (2) and (3) limit the pooled CPS file to respondents residing in the seven LEHD states. While CPS respondents may not necessarily reside in the same state in which they work, the CPS does not permit the distinction. One also cannot decompose annual earnings across employers, meaning that wage and earnings values are not fully comparable to those in Table 2, which are for the dominant employer only. Column (3) further imposes a full-time status restriction and eliminates individuals working at multiple jobs in a given year. This should make the CPS and LEHD earnings data more comparable to the extent that "jobs" and "employers" are one and the same–the CPS questionnaire does not define the term–and assuming sample selection is not overly severe. In recent work matching the CPS to the Detailed Earnings Records (DER) at the Social Security Administration, Roemer (2002) finds approximately 80% of the 86% of CPS wage earners who report a single job in a given year have a single employer. In contrast, around 30% of all CPS wage earners have multiple employers in a given year.

A comparison of Column (3) in Table 3 to Column (3) in Table 2 shows that the means for most demographic variables, including annual earnings, are actually quite similar in the CPS and LEHD, as one might expect. The industry affiliation of respondents in the CPS also closely parallels those in the LEHD data. There are, however, two exceptions. First, the percentage of respondents who are white is substantially lower in LEHD data than in the CPS (66% versus 82%). Second, annualized wages are noticeably larger in the LEHD analysis sample than in the CPS ($38,710 versus $33,827). The former discrepancy can likely be attributed to the poor quality of the race variable contained in Census administrative files (Bye 1998). The latter discrepancy is likely due to differences in how earnings were converted to annualized wages in the two data sets. Lacking information on quarterly labor force attachment in the CPS, we defined annualized wages as annual earnings divided by weeks worked and multiplied by 50.

Finally, Column (4) of Table 3 presents summary statistics for those respondents in the 1990-2000 pooled March CPS we were able to link contemporaneously to the LEHD data. This is possible through use of a Census internal crosswalk connecting the person identifiers in the LEHD to person and household identifiers in the CPS. For a given year, only those individuals that worked in the same state in the LEHD data as they reported as their state of residence in the CPS were connected, yielding a sample of 50,654 observations. Sample means for the matched CPS-LEHD data are very similar to the CPS analysis sample in Column 3. The richer demographic data available for those individuals in the LEHD data

[10] Unlike the public use version, the internal CPS does not top-code earnings values.

we were able to match to the CPS will be exploited in Section 6 when we compare our human capital measure, h, to more traditional measures.

5 Estimation of Individual Human Capital

5.1 Identification

Mobility of workers across firms is necessary for the separate identification of person and firm effects, and hence essential to our characterization of human capital. These effects are simultaneously identified whenever an individual that appears in the sample works for a firm that employs at least one individual who moves to another firm in the sample. Unfortunately, because the cross product matrix associated with the full design matrix is of such high dimension, the standard technique of eliminating singular row-column combinations will fail if one attempts to solve the normal equations by direct inversion of the cross product matrix. Alternatively, identification of person and firm effects can be conceptualized by assigning workers and firms to G mutually exclusive, internally connected groups. To define a group, start with an arbitrary individual and include all firms that he or she ever worked for. Next, add all individuals who ever worked in any of those firms. Following this, add all additional firms that any of these individuals ever worked for, then all individuals in any of those firms, et cetera. When no more individuals or firms can be added , the process begins again for a new group and continues until all data are exhausted. Hence, no person or firm ever belongs to more than one group.

Abowd, Creecy, and Kramarz (2002, hereafter ACK) demonstrate that within each group, all person and firm effects are identified up to a single constraint: a weighted sum of either the person or firm effects must equal zero. In practice, we impose a zero mean for all person effects within each group, meaning that person effects cannot be directly compared across groups unless we assume that their mean values are the same. Imposition of the identification restriction implies that the resulting equations are now of full rank, meaning the solution for the parameter vector is unique. Thus, exactly $N + J - G$ total person and firm effects are identified.

Table 4 presents the results of applying the grouping algorithm to the LEHD analysis sample described in Section 4. While fewer than four percent of individuals ever move between the seven states under consideration, this is more than sufficient to connect 99.3% of all person-year-state observations into a single group containing 285 million of the 287 million total observations. The next largest group contains only 90 observations and the remaining 430,530 groups average only 4.3 observations. Similarly, over 94% of individuals and 88% of firms belong to the first group. The overwhelming majority of the remaining 12% of firms are comprised of a single employee. To summarize, the data permit estimation of over 71 million person and firm effects. For all practical purposes, we could eliminate all observations not belonging to the first group and proceed without worry.

Unfortunately, because group one is so large, direct inversion of the cross product matrix associated with the design matrix is still not computationally feasible. Nevertheless, unlike AKM who devised a series of conditional estimation methods, we succeed in directly solving the least squares normal equations through use of a conjugate gradient algorithm (CG) in place of more traditional statistical software.[11] CG algorithms are used frequently in both computer science and computational economics (see Dongarra 1991; Judd 1998) and have proven effective in solving large but highly sparse problems.[12]. In order to reduce computational burden, the CG algorithm requires that $\ln w_{ijt}$ and x_{it} be expressed in deviations from their grand means. Ceteribus paribus, each person effect we estimate therefore represents the difference in earnings for person i relative to the employment duration weighted average of person effects in the pooled data: $\widehat{\theta}_i = \theta_i - \overline{\theta}$. Similarly, each firm effect we estimate represents the difference in earnings for a worker at firm j relative to the employment duration weighted average of firm effects, all else constant: $\widehat{\psi}_j = \psi_j - \overline{\psi}$. Hence, the estimated residual is expressed in terms of deviations of the true residual and the state specific intercept: $\widehat{\varepsilon}_{it} = \varepsilon_{it} - \lambda$. The grand means of $\widehat{\theta}_i, \widehat{\psi}_j$, and $\widehat{\varepsilon}_{it}$ are therefore all equal to zero.

5.2 Pooling Estimates Across States

We are currently unable to estimate equation (11) simultaneously for all seven states, due again to the large scale of the data. Furthermore, while estimation at a state-by-state level is feasible, the resulting estimates of θ, ψ, and ε for each state f are all expressed net of their state specific means and intercept. To the extent that $\lambda_f, \overline{\theta}_f$, and $\overline{\psi}_f$ differ from $\lambda, \overline{\theta}, \overline{\psi}$, neither person effects nor firm effects will be comparable across states. To solve this problem, we construct estimates for $(\lambda_f - \overline{\lambda}), (\overline{\theta}_f - \overline{\theta})$, and $(\overline{\psi}_f - \overline{\psi})$ and add them our state level estimates. The adjusted person and firm effects, should now closely approximate the estimates we would have obtained had we been able to conduct our analysis on the pooled data.

To see this more formally, re-write equation (11) for a single state f as follows

$$\ln w_{ijt} = \lambda_f + \overline{\theta}_f + \overline{\psi}_f + x_{it}\beta_f + (\theta_i - \overline{\theta}_f) + (\psi_{J(i,,t)} - \overline{\psi}_f) + \varepsilon_{it}, \tag{14}$$

where for notational convenience we add and subtract the state level person and firm effect means. While $\lambda_f, \overline{\theta}_f$, and $\overline{\psi}_f$ cannot be separately identified, we can identify their sum $\delta_f = \lambda_f + \overline{\theta}_f + \overline{\psi}_f$ by exploiting the fact that a regression "goes through the (collective)

[11] The CG algorithim used by by LEHD was developed by Robert Creecy of the U.S. Census Bureau and is available upon request. For more details see Abowd, Creecy, and Kramarz (2002).

[12] The approach has been used recently by Lengermann (2002), Abowd, Haltiwanger, Lane, and Sandusky (2002), and Abowd, Haltiwanger, Jarmin, Lane, Lengermann, McCue, McKinney, and Sandusky (2002).

mean." Hence, $\delta_f = \overline{\ln w}_f - \overline{x}_f\beta_f$. Next, define

$$\overline{\beta} = \sum_f \omega_f \beta_f \tag{15}$$

$$\overline{\delta} = \sum \omega_f \delta_f = \overline{\lambda} + \overline{\theta} + \overline{\psi} \tag{16}$$

where ω_f is an employment weight for state f chosen from external data such that $\sum_f \omega_f = 1$.[13] Like δ_f, both $\overline{\delta}$ and $\overline{\beta}$ can be computed directly from the state level estimates. The difference between δ_f and $\overline{\delta}$ is comprised of all terms needed to adjust our state level estimates:

$$\delta_f - \overline{\delta} = (\lambda_f - \overline{\lambda}) + (\overline{\theta}_f - \overline{\theta}) + (\overline{\psi}_f - \overline{\psi}) \tag{17}$$

Because the three terms on the right hand side of equation (17) cannot be separately identified, we use the proportion of the state level variation in $\ln w_{ijt}$ explained by θ_i and ψ_j to allocate portions of equation (17) to the state level person and firm effects:

$$\widehat{\overline{\theta}_f - \overline{\theta}} = \frac{Cov_f[\theta, y]}{Var_f[y]}(\delta_f - \overline{\delta}) \tag{18}$$

$$\widehat{\overline{\psi}_f - \overline{\psi}} = \frac{Cov_f[\psi, y]}{Var_f[y]}(\delta_f - \overline{\delta}) \tag{19}$$

The remainder is used to approximate the difference between the intercept for state f and the hypothetical pooled intercept

$$\widehat{\lambda_f - \overline{\lambda}} = \delta_f - \overline{\delta} - \widehat{\overline{\theta}_f + \overline{\theta}} - \widehat{\overline{\psi}_f + \overline{\psi}} \tag{20}$$

For each state, we add equation (18) to the estimated person effects, and equation (19) to the estimated firm effects. The intercept adjustment equation (20) is included in $x_{it}\widehat{\beta}_f$.[14] The resulting estimates now approximate those that would have been obtained were it possible to process the entire pooled data set simultaneously. They should therefore be fully comparable across states. We then impose the identification condition–zero person effect means within each group–using the grouping assignments derived from the pooled data as described above.[15]

[13] We use March 1997 employment from the BLS Covered Employment Statistics, available on-line at http://data.bls.gov/labjava/outside.jsp?survey=sa

[14] We simply include (20) as an extra term in the "non-experience" component of $x_{it}\widehat{\beta}_f$.

[15] A small number of individuals appear in multiple states and therefore receive multiple person effects. For such individuals, we take the observation weighted average of their adjusted person effects prior to identification. A similar procedure would have been necessary for firms, but since SEINs are state specific it is not possible to connect firms operating in multiple states.

All that remains is to adapt our measure of human capital, h, in order to make it similarly comparable across states. For each state, restate equation (13) as follows

$$\widehat{h}_{it} = \overline{\delta} + (\widehat{\theta}_i + \overline{\theta}_f \widehat{-\overline{\theta}}) + x_{it}^{\exp}\overline{\beta}^{\exp}. \tag{21}$$

The intercept and experience component now use the"pooled" parameters and the person effect has been adjusted according to equation (18).[16] Given estimation of the state level parameters, we stress our approach is not difficult to implement and can easily be updated when data from new states become available. It will not be necessary to reproduce any estimates from previous states. as only the adjustment factors will require updating.

6 The Empirical Distribution of Human Capital

6.1 Individual Level Results

Table 5 presents our estimates for β, the parameters associated with the matrix of time varying individual characteristics. This matrix contains a quadratic in experience, year dummies for persons working four full quarters, year dummies for persons working less than four full quarters, and dummies for discontinuous employment, and 0-3 full quarters worked. All of these variables are fully interacted with sex, thereby providing separate estimates for males and females. We contrast the parameter estimates that result from our approximation of equation (11), with those generated by ordinary least squares as well as models that alternately exclude–but do not estimate–person and firm effects. The enormous scale of the data ensures that virtually all parameters are estimated with a high degree of precision. Because all parameters estimates are statistically significant at the 1% level or better, we do not report standard errors. Interestingly, both models that control for person heterogeneity explain a much larger fraction of the variance of log real annualized wages (between 81% and 84%) than the model which only controls for firm effects (47%). All three, however, considerably outperform the more traditional model in Column (1) which ignores person and firm heterogeneity. Clearly, this represents one of the primary contributions of our approach.

When comparing the parameter estimates for the four different models, recall that to the extent person and firm effects are not orthogonal to X, estimates of β will be biased unless researchers simultaneously control for *both* persons and firms. For both males and females, the return to experience varies considerably across models, although the implied

[16] Our discussion has assumed that the variables in x_{it} are the same for all states. In practice, this is not always true as x_{it} includes year dummies and our data span different years in different states. We choose 1997 as a reference year in order to restate wages uniformly across states. Hence, in practice, we replace the $\overline{\delta}$ in equation (21) with $\overline{\delta}_{1997}$, where $\overline{\delta}_{1997} = (\overline{y}_{1997} - \overline{x}_{1997}\overline{\beta})$. This means that h_{it}, the adjusted ψ_j, the adjusted, non-experience part of $x_{it}\beta$, and ε_{it} no sum to $\ln w_{it}$.

profile for men is always steeper than the one for women, as Blau and Kahn (2000) find to be the case in other data sets. While concave, the experience profiles in Column (4) do not decline over the usual productive life of an individual, as is generally found in other studies (Willis 1987; Topel and Ward 1992; Altonji and Williams 1997). Controlling for person heterogeneity considerably increases the returns to experience. The implied return to 10 years of experience is 47% for men (35% for women) when ignoring both person and firm heterogeneity, 125% (113%) when controlling for person effects only, 43% (27%), when controlling for firm effects only, and 99% (84%) when controlling for both persons and firms simultaneously.

As expected individuals working 1-3 full quarters per year earned less than those who were full quarter employed for the entire year, although the penalty declines slightly after controlling for firm effects and considerably after controlling for person effects. Similarly, in Column (1) workers who were discontinuously employed receive extremely large wage penalties.[17] While controlling for firm effects reduces this penalty slightly, controlling for individual heterogeneity eliminates it altogether. Full time workers who are discontinuously employed are clearly a highly unusual group. To summarize, both person and firm heterogeneity are related to the observable, time varying characteristics of workers, although firms appears to exert less of an influence on the resulting parameter estimates than persons.

Finally, Table 6 presents simple correlations of the wage components obtained from estimating equation (11) separately for each of the seven states and then adjusting the resulting estimates according to the strategy outlined in Section 4.2. By construction, the wage residual, ε, is completely orthogonal to all other wage components. Person and firm heterogeneity are both highly correlated with annualized wages (0.47 and 0.48 respectively), despite not being particularly related to each other (0.08).[18] The correlation between time varying individual characteristics, $x\beta$, and annualized wages, while positive (0.22), is smaller than the correlation between either person or firm effects and wages. Interestingly, $x\beta$ is strongly negatively correlated with the individual person effect, θ (-0.55). This suggests younger generations of workers are more highly skilled, although this appears to be largely driven by α, the unobservable part of the individual effect , and not $u\eta$, the part due to sex, race, and education. While we discuss the decomposition of θ at greater length below, we note here that α is more highly correlated with annualized wages than $u\eta$ (0.45 versus 0.21). Furthermore, only a small part of θ appears to be correlated with the labor market return to observable characteristics. The correlation between θ and α is 0.96, compared to only 0.28 for θ and $u\eta$.

[17] Recall those who are discontinuously employed also work 0 full quarters. Thus, in Table 5, Column (1) the wage penalty for discontinuous employment is approximately 57% for men and 40% for women.

[18] Abowd, Kramarz, Lengermann, and Perez-Duarte (2002) document a stronger relationship between person and firm heterogeneity at higher levels of aggregation. Curiously, while the correlation across industries is positive as any model of positive, assortive matching would predict, the correlation is actually negative within industries.

6.2 Comparisons to More Traditional Human Capital Measures

Person fixed effects capture the labor market return to all time-invariant personal characteristics and represent the primary innovation of our approach to measuring human capital. However, to what extent do they represent value added beyond what can be obtained from more traditional measures like sex, education, and race? If much of what is contained in the parameter estimate we call θ can be explained by these factors, then perhaps simpler estimation procedures might yield equally predictive but more easily interpretable measures. The first two columns in Table 7 present the results of decomposing the 68 million person effects we estimated previously on both race and education, fully interacted with sex. Because, education was obtained through a statistical match and race has been shown to be somewhat problematic in Census administrative data, the next two columns presents results from an identical decomposition using the matched CPS-LEHD data set described in Section 3. These matched data permit the use of education, race, and sex variables as directly reported by respondents in the CPS.

To a large extent, this distinction turns out not to matter, as the parameter estimates from both data sets are quite similar and robust to other specifications. Ceteribus paribus, white males enjoy 14.5% higher person fixed effect (15.8% in the CPS-LEHD). In comparison, the 4% (1.2%) race premium for females is considerably smaller. Whether these differences are due to productive differences or discrimination cannot be determined here. Education is also strongly associated with higher person effects. The parameter estimates for education were 0.082 for men and 0.087 for women using the LEHD data, and 0.087 and 0.091 respectively in the CPS-LEHD data. These estimates capture the labor market return to an additional year of schooling net of the potentially confounding influence of firm heterogeneity. This distinction could not be made in most previous studies of the returns to education (Card 1999). Our estimates are lower than those obtained from simple OLS and more in line with studies which pursue the "true" return through use of various natural experiments (e.g. Ashenfelter and Krueger 1994; Angrist and Krueger 1991). Thus, perhaps part of the omitted variables bias associated with the returns to education results from sorting of high education workers into high wage firms. Both Kremer and Maskin (forthcoming) and Lengermann (2002) document rising skill segregation within firms over the past two decades in the United States.

While education, race, and sex are strongly related to person fixed effects, it is important to emphasize that they only explain between 8-11% of the total variation in θ. The vast majority is explained by factors unobserved by the econometrician, which we have labelled α above. While we refrain from further speculation as to what these factors might be–innate ability, educational quality, social capital, effort, and luck are all possibilities–the fact remains that their collective sum receives a labor market valuation which our estimation approach permits us to identify. We believe such information should not be ignored when measuring human capital, and show below that its inclusion helps reveal several trends which

would not otherwise have been discerned.

Another way to gauge the value added of our approach is to include measures like $\theta, \alpha, u\eta$, and ψ in a familiar data set like the CPS. We present results from this experiment in Table 8, using the matched CPS-LEHD data described in Section 4. Column (1) shows the results of regressing log real annualized wages on the same time varying individuals characteristics, x_{it}, we used with the pooled LEHD data but derived from CPS variables[19]. The resulting R^2 of 0.153 is comparable to the R^2 of 0.14 obtained from an identical regression using the pooled LEHD data (see Table 5, Column (1)). Were all variables in the pooled LEHD data and the CPS defined identically and measured without error, one would expect the parameter estimates on θ and ψ to be approximately equal to one when added to the variables in Column (1). Column (2) shows that while this is not true, the estimates are nevertheless large and highly statistically significant: 0.54 (t=136.7) for θ and 0.66 (t=90.0) for ψ. Furthermore, the R^2 rises considerably to 0.46 with their inclusion. Introducing, $u\eta$ and α in place of θ further increases the R^2 to 0.54 as shown in Column (3). A more typical wage regression that ignores person and firm heterogeneity but includes education, race, and industry dummies fails to increase the R^2 to such a level, as shown in Column (4). Interestingly, education, race, and industry contribute no additional explanatory power to a model that already includes person and firm fixed fixed effects. A comparison of Columns (2) to Column (5) shows the R^2s are virtually identical.

6.3 The Economy-wide distribution of Human Capital

In this section, we study how the distribution of wages, wage components, and human capital evolved in the five years between 1992 and 1997. While we would have liked to study a longer time period, it was necessary to choose a range of years for which data from both reference dates were available for a large amount of states. It was unfortunately necessary to eliminate all observations from Florida, Minnesota, and Texas, as data for these states are not available in both periods. The results are presented numerically in Table 9 as well as graphically in Figure 1, where we plot the cumulative distributions of $\ln w, h, x\beta$, and θ along commonly scaled axes. We find that while the wage distribution remained largely unchanged between 1992 and 1997, with only a slight rise in inequality, there appears to have been a pronounced right shift in the distribution of human capital. This shift is the result of a small right shift in the experience component of human capital coupled with a larger right shift in the distribution of person effects. All of these trends can be easily discerned by reading across the top row of Figure 1.

The bottom panels of Figure 1 decompose the top panels by showing distributions of the same four variables separately for labor force entrants, exiters, and continuers. We label as entrants all individuals who appeared in our data in 1997 but not 1992 (6.1 million),

[19]Recall both the dependent variable and sample selection criteria differ slightly as well in our pooled LEHD and matched CPS-LEHD data.

exiters all individuals who appeared in 1992 but not 1997 (4.7 million), and continuers all who appeared in both periods (13.2 million). Hence, the overall distribution of each variable in 1992 is the sum of the distributions for exiters and continuers in 1992, while the overall distribution in 1997 is sum of the distributions for entrants and continuers in 1997. Thus, the small change in the overall wage distribution appears to be the result of a right shifted distribution for continuers offset by a net reduction of high wage individuals in the economy due to the lower wages of entrants relative to exiters. Not surprisingly, labor force entrants are younger and less experienced than both exiters and continuers, as well as slightly less educated, and considerably less likely to be white. Table 10 presents mean values for both the observable and unobservable characteristics of entrants, exiters, and continuers.

The right shift in the distribution of human capital, h, appears to be the result of a large right shift in human capital for continuers coupled with a smaller net reduction in the human capital from entry and exit. Continuers increased their human capital through higher experience, as shown by the third panel on the bottom row. Despite the net reduction in total human capital from entry and exit, many entrants nevertheless were more skilled than the exiters they replaced. Below the 40th percentile of their respective distributions, entrants appear had higher human capital . To summarize, while the highest skill exiters were more skilled than the highest skilled entrants, low skilled entrants had more human capital than the low skilled exiters they replaced.

Perhaps the most interesting result in this section comes from decomposing the right shift in the distribution of person effects. Since person effects are time invariant by definition, the shift in the overall distribution of θ can only be due to higher person effects of entrants relative to exiters. As shown in the bottom right panel of Figure 1, this difference is strikingly large. Labor market entrants possess considerably higher person effects at all points along the distribution. At the fiftieth percentile, for example, the difference is 41 log points. Holding experience constant, adding this to the reference constant embedded in h ($\overline{\delta} = 8.65$) implies that entrants had annualized wages approximately \$2,900 higher than exiters in 1994 dollars. Given entrants are on average 8 years less experienced, have slightly lower education, and are considerably less likely to be white, this is a surprisingly large difference. Above the 25th percentile, entrants even have higher person effects than continuers at corresponding points in their distribution.

In combination, these facts strongly suggest that as entrants accumulate labor market experience the overall distribution of human capital will continue to shift right at an accelerated pace. We emphasize again that individual person effects, θ, mostly capture the labor market return to unobserved worker characteristics. By simply relying on wages or other "usual suspects" like education and experience as proxies for skill, it would not have been possible to discern this trend. We view this as the most important contribution of our approach to measuring human capital.

There is, however, one final puzzle that remains to be explained. How could the right shift in the overall distribution of human capital not be accompanied by a similar shift in

the wage distribution? The answer nicely highlights the importance of distinguishing person specific components of wages from firm specific components. While the overall distribution of firm effects remained largely unchanged between 1992 and 1997 (see Table 9), labor force entrants matched to lower ψ firms than both exiters and continuers. Table 10 shows the mean firm effect (ψ) for entrants is 4 log points less than that of exiters, and 10 and 11 points less than that of continuers in 1992 and 1997 respectively. Part of this difference can be explained by differences in the industry affiliation of entrants in relation to exiters and entrants. Table 10 shows that entrants were less likely to work in Manufacturing than exiters, but more likely to work in Retail trade and Services. While industry average firm effect have been shown to be high in manufacturing (see ACK; Lengermann 2002), they are considerably below average in retail trade, and essentially zero in services. Continuers are actually more likely to work in Manufacturing and less likely to work in Retail trade or Services than both exiters and entrants. Thus, while continuers already have higher human capital than entrants due to greater labor market experience, the wage gap between the two groups was further exacerbated by the tendency for continuers match to firms with high internal wages and entrants to match to firms with low internal wages.

This fact is confirmed in Table 11 which shows the mean characteristics of entrants, exiters, and continuers, broken out by SIC division. Here as well, industry average firm effects are highest in Manufacturing, lowest in Retail Trade, and approximately zero in Services. More surprisingly, however, the table also suggests that even *within* SIC division entrants match to lower ψ firms. This is true in spite of the fact that the mean person effect of entrants is higher than both exiters and continuers in virtually every industry. In Manufacturing, for instance, the average firm effect was 0.18 for exiters and 0.22 for continuers in 1992 (0.21 in 1997), but only 0.12 for entrants. In retail trade, mean firm effects are approximately the same for exiters and entrants (-0.25 and -0.26 respectively) but still less than that of continuers (-0.20 and -0.17 in 1992 and 1997). Thus, differential sorting by entrants, continuers, and exiters both within and across industries may explain why the right shift in the distribution human capital was not accompanied by a similar shift in the wage distribution.

7 Firm and Industry Level Human Capital Distributions

7.1 Estimation

We now turn to the heart of our empirical analysis, the estimation of $g_{jt}(h)$. Our analysis sample consists of 362,004 SEIN-based businesses for 1992 and 402,535 for 1997. As was the case in Section 6.3, it unfortunately was necessary to drop all observations from Florida, Min-

nesota, and Texas, as these states did not contribute data in both time periods.[20] Tables 12 and 13 show the distribution of these businesses by 1987 SIC. Our original sample contained about 1.2 million SEINs in 1992 and 1.4 million SEINs in1997 but we eliminated SEINs with fewer than five employees as our estimation procedure is unreliable for such small employers. However, the businesses in our analysis sample represent over 80% of the SEINs present in our data files (employment weighted) and 98% of the SEINs among the SICs covered by the Economic Censuses (employment weighted). Entry and exit of businesses is permitted between 1992 and 1997.

For every employee in each SEIN-year pair we use the human capital skill index, $\widehat{h}_{ijt}$, as defined in equation (21) to form the basis for our nonparametric estimator of $g_{jt}(h)$. Since our focus is on firms, we add a j subscript to h to clarify subsequent exposition. We will use the firm-specific component of wages, $\widehat{\psi}_j$, to estimate the value of z in our theoretical model. We apply a smoothed, optimized bandwidth, kernel density estimator with a normal kernel to produce an estimator $\widetilde{g}_{jt}(h)$ which is calculated over 401 evenly-spaced points in the interval $[\underline{H},\overline{H}] = [4, 16]$.[21] We then combine this data-based estimator with a uniform prior probability over the same grid to produce our estimator

$$\widehat{g}_{jt}(h) = (1-\rho)\widetilde{g}_{jt}(h) + \rho\frac{1}{401} \tag{22}$$

with $\rho = 0.005$. The use of the Bayesian estimator reflects both practical and theoretical concerns. We wanted to allow firms to hire an employee anywhere in the skill range $[4, 16]$ with positive probability, even if the observed employees were such that the automatic kernel density estimator produced estimates of zero over some parts of this interval.

Using our pooled data subset to California, Illinois, Maryland, and Illinois over the period from 1990 to 2000, the deciles of the distribution of $\widehat{h}$ divide the support into 10 intervals with boundaries (4.00, 9.49, 9.73, 9.92, 9.83, 10.08, 10.24, 10.41, 10.60, 10.82, 11.15, 16.00), which we call $(b_0, ..., b_{10})$. Thus, for any firm j during year t, the proportion of its employees that falls in each decile k of the human capital distribution can be estimated by $\Pr[b_{k-1} < h_{ijt} \leq b_k] = \widehat{G}_{jt}(b_k) - \widehat{G}_{jt}(b_{k-1})$.

7.2 The Growth in Human Capital Across Industries

Tables 12 and 13 display the average proportion of employees in each decile of the skill distribution for most 2 digit industries.[22] The columns reveal which industries have work forces with more or less general human capital, as measured by h. We emphasize that our analysis is not equivalent to ranking employees according to the distribution of wage rates

[20] We also chose 1992 and 1997 in order to eventually match our our data to the 1992 and 1997 Economic Censuses. This will permit the acquisition of additional information about firms.

[21] The estimator $\widetilde{g}_{jt}(h)$ was produced by the KDE procedure in SAS version 8.1.

[22] We exclude Agriculture, Mining, and Government.

because h does not contain the firm-specific component of wages. Using the language of AKM, Tables 12 and 13 show which industries employ high and low wage workers, based on both their observed and unobserved characteristics. They do not show which industries contain high or low wage firms. The previous section demonstrated the importance of such a distinction when studying trends in the overall distribution of human capital.

The first and second panels in Figures 2A-8A graph the data contained in Tables 12.and 13 on the same scale for each major industry division. If employers simply hired workers in proportion to their share in the overall distribution of human capital, both panels would simply show a straight line at 10%. However, the general pattern which emerges for almost all 2-digit industries is quite different. The graphs all have a J-shape, reflecting the tendency to employ at the ends of the human capital distribution rather than mostly in the middle. Very few industries have inverse-U shapes, reflecting a tendency to employ more of the middle of the distribution. As such, the lines tend to cross in the middle of the human capital distribution so that firms with high employment in the bottom decile have lower employment in the top decile than firms with the reverse J-shape. Industries that are low-skill intensive include General merchandise stores, Food stores, Apparel and accessory stores, Furniture and home furnishing stores, Eating and drinking places, Miscellaneous retail, Hotel and lodging services, Personal services, Motion pictures, Amusement and recreation services, Health services, Social services, Museums, botanical, zoological gardens, and Membership organizations. Industries that are high-skill intensive include Building contractors, Heavy construction, Special trade contractors, Printing and publishing, Chemicals and allied products, Petroleum and coal products, Machinery, except electrical, Instruments and related products, Communication, Electric, gas and sanitary services, Wholesale trade-durable goods, Wholesale trade-nondurable goods, Credit agencies other than banks, Security, commodity, brokers and services, Insurance carriers, Insurance agents and brokers, Holding and other investments, Business services, Health services, Legal services, Educational services, Engineering, accounting, research services, and Miscellaneous services.

A comparison of Tables 12 and 13 reveals considerable upskilling occurred between 1992 and 1997 in virtually every industry, a pattern which strongly complements our findings in the previous sections.[23] The trend can also be seen clearly by comparing the top two panels of Figures 2A-8A. For most industries, the left portion of the graph in 1997 lies below the same portion in 1992, while the right portion in 1997 has shifted upwards. That such a large change could have occurred in so many industries over such a short period of time is striking. Looking across all sectors, firm level employment shares in the bottom two skill deciles fell by 7.7% and 5.2% respectively, but increased by 6% in each of the two highest skill deciles. Those industries experiencing particularly large declines in low skill employment include Apparel, Leather, Hotel and lodging services, Eating and drinking

[23]There are exceptions, however. Firms in Textile mill products, Furniture and home stores, Security, commodity brokers and services, and Holding and other investments generally reduced their employment share of high skill workers and increased their share of low skilled workers.

places, Miscellaneous manufacturing, Food stores, Health services, and Social Services. In these industries, employment in the two lowest skill deciles declined on average 15-35%. In contrast, industries with the largest increase in high skill employment include Real estate, Credit agencies, Trucking and warehousing, Electric, gas, and sanitary services, Eating and drinking places, Banking, and Apparel. On average, the employment share in the top two deciles of the human capital distribution increased 12-16% for firms in these industries.

We next consider the degree of heterogeneity in the human capital distribution for firms within the same industry. Tables 14 and 15 show the standard deviation of $\widehat{G}_{jt}(b_k) - \widehat{G}_{jt}(b_{k-1})$ by decile of the h distribution in 1992 and 1997. While we do not graph these data, once again the distributions are mostly U-shaped, reflecting a tendency for more heterogeneity among the extreme values of human capital than in the middle of the distribution. The industries with substantial heterogeneity in the use of the lowest skill employees include Apparel and accessory stores, Eating and drinking places, Miscellaneous retail, Insurance agents and brokers, Personal services, and Motion pictures. The industries with substantial heterogeneity in the use of high skilled workers include Petroleum and coal products, Machinery, except electrical, Electric, gas and sanitary services, Wholesale trade-durable goods, Wholesale trade-nondurable goods, Credit agencies other than banks, Security, commodity, brokers and services, Real estate, Business services, Legal services, Educational services, and Engineering, accounting, research services. Comparing Tables 14 and 15, it appears that between firm variation in employment shares of low skilled workers declined in most industries between 1992 and 1997 but increased for high skilled workers.

7.3 Continuing, Entering, and Exiting Firms

The question remains whether the above trends are the result of upskilling by surviving firms, entry by relatively high skill firms, or exits by relatively low skill firms. As was the case with workers, we define an exiting firm as one which appears in 1992 but not in 1997, an entering firm as one that does not appear in 1992 but does appear in 1997, and a continuing firm as one which appears in both time periods. The period witnessed large numbers of firm births and deaths. A net increase of 40,531 firms between 1992 and 1997 was the result of 136,092 exiters and 176,623 entrants. Looking first at the 226,009 continuing firms, the bottom panels in Figures 2A-8A plot the mean difference by industry between the skill distribution in 1997 and 1992. Almost without exception, the graphs slope upwards, crossing zero around the 5th decile of the human capital distribution. Much of the upskilling that occurred between 1992 and 1997 therefore appears to be the result of continuing firms reducing employment shares of low skill workers and increasing employment shares of high skill workers. Looking across all sectors, firm level employment in the bottom two skill deciles fell by 5.3% and 3% respectively for continuers but rose between 2.6% and 3% in the two highest skill deciles.

While significant, these values are smaller than the ones described above when discussing

the overall change between 1992 and 1997. This suggests that entering firms have opted for production schemes which rely on relatively larger shares of high skill workers than exiting and continuing firms. To examine this more closely, Tables 16-18 in conjunction with Figures 2B-8B contrast the average proportion of employees in each decile of the skill distribution for exiters, entrants, and continuers in 1992. Entering firms are decidedly more skilled that the exiting firms they replace. In almost every industry, the left portion of the graph for entering firms lies below the left portion for exiting firms. In contrast, the right portion of the graph for entrants typically lies above the right portion for exiting firms. Interestingly, the skill distribution of continuing firms, at least in 1992, bears a much closer resemblance to exiting firms than entering ones. On the one hand, in many industries it may be possible to use very different worker skill mixes to produce competing products. Alternatively, perhaps two digit industry classifications are still too broad to distinguish between firms that sell goods or services in very different markets (e.g designer retail versus discount retail). Regardless, while continuing firms have upskilled, entering firms are, on average, more highly skilled. This suggests the presence of non-trivial adjustment costs for continuing firms.

8 Conclusion

In this paper, we formally introduced a new approach to measuring human capital, one that captures the return to both observed and unobserved worker characteristics, and is derived from a wage accounting framework that can distinguish between person and firm specific factors. We believe this framework holds numerous advantages over more traditional strategies that focus on a small number of observable characteristics like education and experience. First, we can construct our measure and its underlying components for all 68 million workers in the LEHD data set. Furthermore, because we can match these workers to their employers, we can also create firm and industry level measures of the distribution of human capital. Never before have wage and employment data been constructed on such a large scale. Second, our human capital measures encompass a much broader array of skills, many of which remain unobservable but nevertheless receive a valuation in the labor market that we are able to identify. As such, we succeed in explaining a very large proportion of the total variation in wages. Only a small fraction of the person specific effects we estimate can be explained by education, sex, and race.

The large scale of the data posed a number of difficult empirical challenges. First it was necessary to demonstrate, through use of an algorithm assigning workers and firms to mutually exclusive, internally connected groups, that virtually all effects were in fact estimable. Second, although direct inversion of the cross product matrix associated with the design matrix was not computationally feasible, we did succeed in directly solving the least squares normal equations separately for each state through use of a conjugate gradient algorithm. Unfortunately, this implied that the resulting human capital estimates were

not initially comparable across states. As such, we developed an adjustment process to approximate the estimates that would have been obtained had we been able to analyze the entire pooled data set. Finally, in order to better characterize the workforce composition of firms, we developed a smoothed non-parametric estimator of the within firm distribution of human capital.

We find the overall distribution of human capital shifted to the right over the five year period of 1992-1997, a result due to an even larger shift for labor market continuers combined with a net reduction in human capital from entry and exit. Nevertheless, while exiting workers were highly experienced and equally as educated, when we consider the unobservable component of their human capital, they appear much less skilled than both entering and continuing workers. In contrast, a large proportion of entrants, while less experienced than continuing workers, were otherwise more highly skilled. Such trends would not have been discernible had we relied on education, experience, or wages to proxy for worker skill. On a related note, the right shift in human capital was not accompanied by equivalent movements in the wage and education distributions, a finding which highlights the importance of removing firm heterogeneity from human capital measures. Labor force entrants matched to firms with below average internal wages, while continuers matched to firms with above average internal wages, thereby exacerbating pre-existing wage differences.

At the firm level, the most striking pattern to emerge is the widespread tendency to employ workers at the ends of the human capital distribution rather than the middle. Heterogeneity in the human capital distribution of firms within the same industry was found to be similarly U-shaped. Between 1992 and 1997, between firm variation in the employment shares of low skilled workers declined, while the average firm in virtually every industry became noticeably more skilled. Given the relatively short period under consideration, this trend is particularly striking. Some of it can be explained by a pronounced trend among surviving firms to reduce employment shares of low skill workers. The rest is due the tendency of new firms to employ more highly skilled workforces than exiters and continuers, a fact which remains true both within and across sectors.

While the data used in this study are confidential, the U.S. Census Bureau is preparing to support access by external researchers. With the establishment of access protocols, it is our fervent hope that more researchers will use LEHD data and thereby further assess the merits of our approach in addition to suggesting alternative strategies. To provide a few examples of the latter, Woodcock (2002) develops a framework for identifying job match effects in addition to worker and firm effects, Stinson (2002) models the simultaneous determination of wages and worker mobility in the context of the debate over health insurance and job lock, and Lengermann (2002) studies the contribution of co-worker characteristics to both individual wage outcomes and wage inequality.

Clearly, there are very many directions for future research, several of which are presently underway. We are particularly interested in developing models which permit the structural estimation of the demand for human capital. Such work would nicely complement the analy-

sis in this paper and should be made possible with the acquisition of additional firm level information, most notably sales and capital, from the Economic Censuses and Census Business Register. Such information has already been used effectively by Abowd, Haltiwanger, Jarmin, Lane, Lengermann, McCue, McKinney, and Sandusky (2002) who study the contribution of human capital to business productivity and shareholder value, and Abowd, Haltiwanger, Lane, and Sandusky (2002) who study the relationship between technology, human capital, and productivity. Finally, a straightforward but potentially rewarding avenue for future work might involve using the human capital measure developed here to revisit the literature on growth accounting. To the extent our measure contains considerable value added over previous efforts to value labor inputs, such a research project may yield interesting and important new results.

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Table 1: Composition of the Pooled LEHD Data Set

State	Dates	Persons	Firms	Annual Observations
California	1992-1999	22,524,212	1,314,847	98,874,945
Florida	1993-1998	10,274,254	592,086	35,756,341
Illinois	1990-1998	9,221,329	446,282	44,949,269
Maryland	1986-1998	4,622,215	251,115	24,924,374
Minnesota	1996-2000	3,403,559	171,335	13,227,876
North Carolina	1991-2000	6,153,870	320,630	29,335,195
Texas	1996-1999	12,129,773	566,679	40,173,891
Total	--	68,329,212	3,662,974	287,241,891

Notes: Individuals contribute at most one observation per year for each of the above states for which they worked. Data are restricted to fulltime workers, aged 18-70, at the firm for which they had the highest earnings in each state.
Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Table 2: Sample Construction & Mean Values, LEHD Data 1990-2000

	(1)	(2)	(3)
	Base Sample	Dominant Employer Sample	Analysis Sample
N	538,330,595	362,544,623	287,241,891
Earnings & Demographics:			
Annualized Wage ($1994)	27,200	33,188	38,710
Raw Earnings ($1994)	22,561	24,537	29,413
Education	12.45	12.53	12.69
Male	52.7%	52.6%	55.5%
Age	34.67	36.07	37.43
White	62.7%	64.8%	66.2%
Experience	17.02	18.31	19.32
Industry Affiliation:			
Agriculture	3.6%	3.0%	2.8%
Mining	0.4%	0.4%	0.5%
Construction	6.8%	6.5%	7.1%
Manufacturing	12.8%	13.9%	16.3%
TCU	5.2%	5.5%	6.3%
Wholesale Trade	6.0%	6.4%	7.3%
Retail Trade	20.7%	19.8%	15.3%
FIRE	5.7%	5.9%	6.6%
Services	35.9%	35.3%	34.2%
Public Administration	2.5%	2.8%	3.2%
Labor Force Attachment:			
Fulltime	82.8%	82.3%	100.0%
Discontinuously Employed	19.0%	9.2%	5.4%
0 Full Quarters Worked	41.2%	23.4%	16.4%
1 Full Quarter Worked	13.6%	13.4%	12.6%
2 Full Quarters Worked	8.5%	11.0%	11.1%
3 Full Quarters Worked	6.8%	9.4%	10.2%
4 Full Quarters Worked	30.0%	42.9%	49.7%

Notes: Earnings and labor force attachment data originate from unemployment insurance wage records from California, Florida, Illinois, Maryland, Minnesota, North Carolina, and Texas from 1990-2000. No single state contributed observations for all years. See Table 1. Demographic characteristics and industry affiliation were added through linkages with other Census Bureau and LEHD data bases. Education and fulltime status have been imputed using statistical matching procedures. Column (2) restricts the sample to individuals employed at their "dominant" employer in each year, i.e. the employer where an individual has the highest earnings. Column (3) further restricts the sample to fulltime workers, aged 18-70.
Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Table 3: Current Population Survey, Mean Values, 1990-2000

	(1)	(2)	(3)	(4)
	Base Sample	Base Sample	Analysis Sample	CPS-LEHD
	all states	7 LEHD States	(2) plus Sample Restrictions	(3) matched to LEHD
N	779,932	225,791	151,312	50,654
Earnings & Demographics:				
Annualized Wage ($1994)	26,233	26,892	31,289	33,827
Annual Earnings ($1994)	24,711	25,316	30,534	33,330
Education	13.09	12.98	13.07	13.25
Male	52.5%	53.1%	57.3%	58.6%
Age	37.95	37.88	39.25	40.00
White	84.6%	82.7%	82.0%	83.8%
Potential Experience	18.86	18.90	20.17	20.75
Industry Affiliation:				
Agriculture	2.1%	2.4%	2.2%	1.9%
Mining	0.5%	0.5%	0.7%	0.6%
Construction	5.8%	6.0%	6.5%	6.3%
Manufacturing	16.9%	15.6%	19.4%	22.5%
TCU	6.9%	7.1%	8.4%	7.9%
Wholesale Trade	3.8%	4.1%	4.7%	5.1%
Retail Trade	18.1%	18.1%	13.5%	12.7%
FIRE	6.3%	6.5%	7.2%	7.6%
Services	34.7%	34.8%	31.5%	31.4%
Public Administration	4.7%	4.8%	5.7%	3.9%
Labor Force Attachment:				
Multiple Jobs	17.9%	17.2%	0.0%	0.0%
Fulltime	79.2%	80.2%	100.0%	100.0%
Weeks Worked	44.93	45.08	47.97	48.99
Hours Per Week	38.63	38.93	43.13	43.32

Notes: All data are from the 1990-2000 Census internal March Current Population Surveys (CPS), restricted to individuals with positive earnings and weeks worked. CPS sample weights are utilized for the above calculations. Annual earnings are the sum of earnings for all jobs held during the year, as the CPS does not permit designation of a "dominant employer." The annualized wages is computed by dividing annual earnings by weeks worked, and then multiplying by 50. I use Jaeger's (1997) "assigned" method to linearize the categorical education variables contained in the post-1992 CPS. Column (2) subsets the data to respondents residing in California, Florida, Illinois, Maryland, Minnesota, North Carolina, and Texas. While a non-trivial fraction of these respondents likely work outside of these states, such information is not contained in the CPS. The data are further restricted in Columns (3) and (4) to individuals aged 18-70, working full time, with annual earnings between $1,000 and $1,000,000 per year from a single job. Only individuals that work/reside in the same state in the same year in both data sets are matched in Column (4).
Sources: Author's calculations using the March CPS and the LEHD Program Employment Dynamics Estimates data base.

Table 4: Results of Applying the Grouping Algorithm to the Pooled Data Set

	Largest Group	*Second Largest Group*	*Average of All Other Groups*	*Total of All Groups*
Observations	285,402,315	90	4.3	287,241,891
Persons	64,441,382	38	1.5	68,329,212
Firms	3,200,067	8	1.1	3,662,974
Groups	1	1	430,529	430,531
Estimable Effects	67,641,448	45		71,992,185

Notes: The "pooled" data are comprised of annual observations from California, Florida, Illinois, Maryland, Minnesota, North Carolina, and Texas over the period 1986-2000. No single state contributed observations for all years. See Table 1.
Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Table 5: Least Squares Estimates of the Effect of Labor Force Experience, Year, and Labor Force Attachment Status on the Log of Real Annualized Wages, LEHD Pooled Data

Variable	*No Person Effects, No Firm Effects* Parameter Estimate	*Within Persons, No Firm Effects* Parameter Estimate	*Within Firms, No Person* Parameter Estimate	*Person, Firm, & Co-Worker Effects* Parameter Estimate
Males:				
Total Labor Force Experience	0.087	0.207	0.078	0.162
(Labor Force Experience)^2/100	-0.369	-0.679	-0.316	-0.498
(Labor Force Experience)^3/1000	0.079	0.138	0.066	0.100
(Labor Force Experience)^4/10,000	-0.007	-0.012	-0.006	-0.009
4 Full Quarters Worked x Year 1990	0.014	0.032	0.009	0.023
4 Full Quarters Worked x Year 1991	0.008	0.026	0.005	0.015
4 Full Quarters Worked x Year 1992	0.038	0.061	0.024	0.047
4 Full Quarters Worked x Year 1993	0.031	0.035	0.019	0.026
4 Full Quarters Worked x Year 1995	0.017	-0.028	0.015	-0.024
4 Full Quarters Worked x Year 1996	0.018	-0.072	0.025	-0.059
4 Full Quarters Worked x Year 1997	0.032	-0.096	0.041	-0.076
4 Full Quarters Worked x Year 1998	0.051	-0.107	0.061	-0.084
4 Full Quarters Worked x Year 1999	0.030	-0.088	0.040	-0.070
4 Full Quarters Worked x Year 2000	0.013	-0.012	0.008	-0.007
< 4 Full Quarters Worked x Year 1990	0.026	0.041	0.016	0.030
< 4 Full Quarters Worked x Year 1991	0.018	0.030	0.012	0.020
< 4 Full Quarters Worked x Year 1992	0.022	0.062	0.019	0.051
< 4 Full Quarters Worked x Year 1993	0.015	0.034	0.011	0.027
< 4 Full Quarters Worked x Year 1995	0.003	-0.029	-0.003	-0.025
< 4 Full Quarters Worked x Year 1996	0.009	-0.065	-0.003	-0.057
< 4 Full Quarters Worked x Year 1997	0.062	-0.061	0.041	-0.054
< 4 Full Quarters Worked x Year 1998	0.083	-0.065	0.059	-0.063
< 4 Full Quarters Worked x Year 1999	0.070	-0.047	0.055	-0.050
< 4 Full Quarters Worked x Year 2000	0.014	-0.003	0.010	-0.002
Discontinuous Employment	-0.385	-0.323	-0.431	-0.327
0 Full Quarters Worked	-0.182	0.343	-0.002	0.363
1 Full Quarter Worked	-0.304	-0.051	-0.242	-0.044
2 Full Quarters Worked	-0.220	-0.054	-0.186	-0.046
3 Full Quarters Worked	-0.142	-0.053	-0.121	-0.045

Table 5: (Continued) Least Squares Estimates of the Effect of Labor Force Experience, Year, and Labor Force Attachment Status on the Log of Real Annualized Wages

Variable	*No Person Effects, No Firm Effects* Parameter Estimate	*Within Persons No Firm Effects* Parameter Estimate	*Within Firms No Person* Parameter Estimate	*Person, Firm, & Co-Worker Effects* Parameter Estimate
Females:				
Total Labor Force Experience	0.067	0.194	0.048	0.142
(Labor Force Experience)^2/100	-0.308	-0.716	-0.186	-0.500
(Labor Force Experience)^3/1000	0.064	0.167	0.036	0.118
(Labor Force Experience)^4/10,000	-0.005	-0.015	-0.003	-0.011
4 Full Quarters Worked x Year 1990	-0.011	0.026	-0.011	0.017
4 Full Quarters Worked x Year 1991	-0.026	0.024	-0.019	0.013
4 Full Quarters Worked x Year 1992	-0.022	0.061	-0.017	0.044
4 Full Quarters Worked x Year 1993	-0.036	0.034	-0.027	0.024
4 Full Quarters Worked x Year 1995	-0.040	-0.030	-0.022	-0.021
4 Full Quarters Worked x Year 1996	-0.043	-0.070	-0.022	-0.050
4 Full Quarters Worked x Year 1997	-0.028	-0.091	-0.001	-0.061
4 Full Quarters Worked x Year 1998	-0.008	-0.098	0.021	-0.059
4 Full Quarters Worked x Year 1999	-0.004	-0.087	0.017	-0.051
4 Full Quarters Worked x Year 2000	0.004	-0.007	0.004	0.003
< 4 Full Quarters Worked x Year 1990	0.015	0.033	0.007	0.023
< 4 Full Quarters Worked x Year 1991	0.009	0.027	0.004	0.017
< 4 Full Quarters Worked x Year 1992	0.016	0.066	0.005	0.050
< 4 Full Quarters Worked x Year 1993	-0.005	0.032	-0.006	0.025
< 4 Full Quarters Worked x Year 1995	-0.003	-0.027	-0.013	-0.021
< 4 Full Quarters Worked x Year 1996	-0.009	-0.065	-0.019	-0.050
< 4 Full Quarters Worked x Year 1997	0.043	-0.056	0.023	-0.040
< 4 Full Quarters Worked x Year 1998	0.070	-0.050	0.045	-0.037
< 4 Full Quarters Worked x Year 1999	0.055	-0.043	0.030	-0.030
< 4 Full Quarters Worked x Year 2000	0.017	0.004	0.014	0.010
Discontinuous Employment	-0.277	-0.283	-0.315	-0.282
0 Full Quarters Worked	-0.134	0.373	0.059	0.394
1 Full Quarter Worked	-0.298	-0.043	-0.225	-0.033
2 Full Quarters Worked	-0.220	-0.050	-0.177	-0.042
3 Full Quarters Worked	-0.170	-0.053	-0.144	-0.043
Pooled:				
Sample Size	287,241,891	287,241,891	287,241,891	287,241,891
Coefficient Degrees of Freedom (β)	72	72	72	72
Individual Degrees of Freedom (θ)	--	68,329,212	--	68,329,212
Firm Degrees of Freedom (ψ)	--	--	3,662,974	3,662,974
Error Degrees of Freedom (ε)	287,241,819	218,912,607	283,578,845	215,249,633
R^2	0.14	0.81	0.47	0.84

Notes: The "pooled" data are comprised of annual observations from California, Florida, Illinois, Maryland, Minnesota, North Carolina, and Texas over the period 1986-2000. No single state contributed observations for all years. See Table 1. Computation of the final column was not feasible given the large scale of the data. As such, the parameter estimates reported represent weighted averages of the parameter estimates that result from estimating the model separately for each state. T-statistics and standard errors are omitted as all variables are highly statistically significant at conventional levels.
Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Table 6: Summary of Pooled Human Capital Wage Components

Component	Standard Deviation	Correlation with: $\ln w$	$x\beta$	θ	α	$u\eta$	ψ	ε
Log Real Annualized Wage Rate ($\ln w$)	0.881	1.000	0.224	0.468	0.451	0.212	0.484	0.402
Time-Varying Personal Characteristics ($x\beta$)	0.691	0.224	1.000	-0.553	-0.575	-0.099	0.095	0.000
Person Effect (θ)	0.835	0.468	-0.553	1.000	0.961	0.275	0.080	0.000
Unobserved Part of Person Effect (α)	0.802	0.451	-0.575	0.961	1.000	0.000	0.045	0.000
Non-time-varying Personal Characteristics ($u\eta$)	0.229	0.212	-0.099	0.275	0.000	1.000	0.101	0.000
Firm Effect (ψ)	0.362	0.484	0.095	0.080	0.045	0.101	1.000	0.000
Residual (ε)	0.354	0.402	0.000	0.000	0.000	0.000	0.000	1.000

Notes: Based on 287,241,891 annual observations from 1986-2000 for 68,329,212 persons and 3,662,974 firms in California, Florida, Illinois, Maryland, Minnesota, North Carolina, and Texas. No single state contributed observations for all years. See Table 1.
Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Table 7: Decomposing Person Effects (θ) Using Matched CPS-LEHD Data

Panel A: OLS Regression of θ on Observable, Invariant Individual Characteristics

	LEHD Data		CPS-LEHD	
	Males:	*Females:*	*Males:*	*Females:*
White	0.145	0.040	0.158	0.012
	(1093.67)	(269.22)	(13.32)	(0.98)
Education	0.082	0.085	0.087	0.091
	(4603.88)	(4642.12)	(70.42)	(67.30)
N	287,241,891		50,654	
R^2	0.084		0.106	

Notes: Data are from the Pooled Human Capital data (LEHD) estimates and the 1990-1999 Matched CPS-LEHD data described in Table YY, Column 4. Panel A regresses the person effect as obtained from the Pooled Human Capital data (LEHD) on a race dummy and education variable (fully interacted with sex). This is done for both data sets but in the full LEHD data set sex, race, and education (imputed) come from Census administrative files. For the CPS-LEHD sample, the same 3 variables are taken directly from the CPS. Richer specifications fail to explain a larger portion of the variance. CPS sample weights are utilized for all calculations using the matched CPS-LEHD data. Panel B computes the correlations between the CPS variables (ln w) and xβ, LEHD variables θ and ψ, and an implied residual: lnw - xβ - θ - ψ. The vector of paramter estimates, β, is from Table 7, Column 2. The observable part of person effect (uη) comes directly from Panel A. The unobserved part of person effect (α) is the residual produced from the regression in Panel A.

Sources: Author's calculations using the Census internal March CPS and the LEHD Program Employment Dynamics Estimates data base.

Table 8: Matched CPS-LEHD Wage Regressions

	(1)	(2)	(3)	(4)	(5)
Variables From Pooled CPS:					
Males:					
White	--	--	--	0.206	0.187
				(20.69)	(22.18)
Education	--	--	--	0.111	0.118
				(85.92)	(6.62)
Total Labor Force Experience	0.143	0.113	0.108	0.116	0.105
	(30.32)	(29.88)	(30.77)	(24.86)	(26.54)
(Labor Force Experience)^2/100	-0.671	-0.355	-0.306	-0.467	-0.294
	(17.79)	(11.72)	(10.98)	(12.95)	(9.64)
(Labor Force Experience)^3/1000	0.145	0.065	0.045	0.083	0.042
	(12.91)	(7.26)	(5.46)	(7.95)	(4.77)
(Labor Force Experience)^4/10,000	-0.013	-0.006	-0.003	-0.006	-0.002
	(11.59)	(6.34)	(3.41)	(5.71)	(2.84)
Year 1990	0.111	-0.037	-0.045	0.041	-0.047
	(4.18)	(1.74)	(2.30)	(1.77)	(2.39)
Year 1991	-0.012	-0.179	-0.153	-0.031	-0.150
	(0.51)	(9.10)	(8.45)	(1.45)	(8.22)
Year 1992	0.029	0.022	0.032	0.031	0.032
	(1.49)	(1.40)	(2.26)	(1.80)	(2.23)
Year 1993	-0.022	0.015	0.008	-0.026	0.009
	(1.21)	(1.03)	(0.63)	(1.64)	(0.69)
Year 1995	-0.029	0.016	0.008	-0.043	0.005
	(1.65)	(1.12)	(0.65)	(2.74)	(0.38)
Year 1996	-0.029	0.002	-0.004	-0.042	-0.007
	(1.75)	(0.13)	(0.36)	(2.83)	(0.59)
Year 1997	-0.021	-0.002	-0.008	-0.036	-0.011
	(1.28)	(0.14)	(0.68)	(2.37)	(0.89)
Year 1998	0.034	0.015	0.004	0.001	0.000
	(2.00)	(1.08)	(0.30)	(0.05)	(0.03)
Year 1999	0.019	0.012	0.019	0.022	0.019
	(1.07)	(0.82)	(1.39)	(1.33)	(1.35)
Females:					
White	--	--	--	0.097	0.086
				(9.27)	(9.72)
Education	--	--	--	0.120	0.130
				(74.89)	(95.09)
Total Labor Force Experience	0.106	0.089	0.090	0.095	0.086
	(21.08)	(22.27)	(24.34)	(19.30)	(20.56)
(Labor Force Experience)^2/100	-0.584	-0.327	-0.319	-0.490	-0.303
	(14.08)	(9.86)	(10.43)	(12.43)	(9.10)
(Labor Force Experience)^3/1000	0.139	0.075	0.068	0.112	0.066
	(11.02)	(7.45)	(7.33)	(9.56)	(6.63)
(Labor Force Experience)^4/10,000	-0.013	-0.007	-0.006	-0.010	-0.006
	(10.08)	(7.19)	(6.42)	(8.33)	(6.00)
Year 1990	-0.031	-0.115	-0.117	-0.047	-0.114
	(1.01)	(4.75)	(5.23)	(1.77)	(5.06)
Year 1991	-0.069	-0.206	-0.168	-0.046	-0.163
	(2.50)	(9.32)	(8.22)	(1.89)	(7.88)
Year 1992	0.007	0.020	0.036	0.035	0.035
	(0.34)	(1.15)	(2.27)	(1.85)	(2.17)
Year 1993	-0.012	0.007	0.016	0.013	0.016
	(0.62)	(0.42)	(1.08)	(0.72)	(1.07)
Year 1995	-0.028	-0.030	-0.028	-0.018	-0.029
	(1.45)	(1.93)	(2.00)	(1.03)	(2.01)
Year 1996	-0.022	-0.035	-0.032	-0.014	-0.033
	(1.18)	(2.42)	(2.36)	(0.85)	(2.40)
Year 1997	-0.015	-0.041	-0.033	0.002	-0.032
	(0.81)	(2.82)	(2.43)	(0.13)	(2.30)
Year 1998	-0.008	-0.036	-0.028	0.008	-0.029
	(0.43)	(2.42)	(2.07)	(0.46)	(2.07)
Year 1999	0.040	0.002	0.006	0.042	0.002
	(1.98)	(0.13)	(0.43)	(2.35)	(0.14)
SIC Division Controls	no	no	no	yes	yes
Variables From LEHD:					
Person Effect (θ)	--	0.541	--	--	--
		(136.70)			
Observable Part of Person Effect ($u\eta$)	--	--	1.372	--	--
			(144.44)		
Unobserved Part of Person Effect (α)	--	--	0.459	--	0.456
			(122.40)		(22.02)
Firm Effect (ψ)	--	0.657	0.577	--	0.519
		(90.02)	(85.03)		(71.45)
R^2	0.153	0.456	0.538	0.363	0.545

Notes: N = 50, 654. All data are from the 1990-1999 Census internal March Current Population Surveys (CPS), restricted to individuals with positive earnings and weeks worked, aged 18-70, working full time, with annual earnings between $1,000 and $1,000,000 per year from a single job. Respondents must also reside in one of the seven states used by LEHD: California, Florida, Illinois, Maryland, Minnesota, North Carolina, and Texas. CPS sample weights are utilized in all calculations. The dependent variable is the natural log of the annualized wage, which is computed by dividing annual earnings by weeks worked and multiplying by 50. When matching to LEHD data, only observations for individuals that work/reside in the same state in the same year in both data sets were kept.

Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Table 9: The Distribution of Real Wages and Wage Components, 1992 versus 1992, LEHD Data

Variable	Year	Std Dev	IQR	95%	90%	75%	50%	25%	10%	5%
						Percentile:				
Annualized Wage ($1994)	1992	$37,290	$28,517	$83,539	$64,923	$44,233	$27,269	$15,716	$8,575	$5,377
	1997	$40,176	$28,974	$89,040	$67,114	$43,989	$26,603	$15,015	$8,096	$5,008
	change	$2,886	$457	$5,501	$2,191	-$244	-$665	-$701	-$478	-$368
Log Real Annualized Wage	1992	0.851	1.035	11.333	11.081	10.697	10.214	9.662	9.057	8.590
	1997	0.883	1.075	11.397	11.114	10.692	10.189	9.617	8.999	8.519
	change	0.032	0.040	0.064	0.033	-0.006	-0.025	-0.046	-0.057	-0.071
Overall Human Capital (h)	1992	0.696	0.871	11.451	11.146	10.700	10.244	9.829	9.491	9.275
	1997	0.678	0.848	11.564	11.272	10.847	10.398	9.998	9.660	9.437
	change	-0.018	-0.023	0.113	0.126	0.147	0.154	0.169	0.169	0.162
Person Effect (θ)	1992	0.754	0.950	1.117	0.879	0.505	0.064	-0.445	-0.966	-1.298
	1997	0.710	0.905	1.169	0.943	0.592	0.175	-0.313	-0.806	-1.113
	change	-0.043	-0.045	0.052	0.064	0.087	0.111	0.132	0.160	0.185
Experience Effect ($x_1\beta_1$)	1992	0.669	1.006	2.680	2.510	2.135	1.672	1.129	0.695	0.444
	1997	0.644	0.992	2.650	2.501	2.170	1.720	1.178	0.741	0.547
	change	-0.025	-0.014	-0.031	-0.009	0.035	0.048	0.049	0.046	0.103
Firm Effect (ψ)	1992	0.347	0.419	0.503	0.423	0.274	0.085	-0.145	-0.385	-0.532
	1997	0.347	0.421	0.513	0.422	0.261	0.069	-0.160	-0.387	-0.531
	change	-0.001	0.002	0.010	-0.001	-0.013	-0.015	-0.015	-0.002	0.001

Notes: LEHD data above are for workers from California, Illinois, Maryland, and North Carolina in 1992 and 1997 employed at the end of the first quarter. Data were not available for Florida, Minnesota, and Texas (see Table 1) in both of these years. Individuals with valid person and firm effects can appear multiple times in a single year if they hold multiple jobs. Both person and firm effects are expressed in deviations from their grand (pooled) means.
Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Table 10: Selected Mean Values for Labor Force Exiters, Entrants, and Continuers

	(1) Exiters 1992	(2) Entrants 1997	(3) Continuers 1992	(4) Continuers 1997
N	4,700,587	6,126,972	13,247,120	13,247,120
Earnings & Demographics:				
Annualized Wage ($1994)	$31,275	$24,675	$36,647	$40,652
Education	12.59	12.19	12.78	12.78
Male	0.50	0.50	0.57	0.57
Age	40.30	32.60	36.54	41.03
White	0.70	0.56	0.68	0.68
Experience (Years)	22.57	14.84	18.68	22.83
Wage Components:				
Experience Effect ($x_1\beta_1$)	1.72	1.30	1.59	1.83
Person Effect (θ)	-0.23	0.15	0.11	0.11
Overall Human Capital (h)	10.14	10.10	10.34	10.60
Firm Effect (ψ)	0.00	-0.04	0.06	0.07
Industry Affiliation:				
Agriculture	2.2%	2.7%	2.0%	1.9%
Mining	0.3%	0.1%	0.3%	0.3%
Construction	5.4%	5.2%	5.7%	6.0%
Manufacturing	17.6%	14.3%	20.8%	20.2%
TCU	6.0%	5.0%	7.0%	7.3%
Wholesale Trade	7.6%	6.6%	8.3%	7.9%
Retail Trade	16.9%	20.2%	13.3%	11.6%
FIRE	7.2%	5.8%	7.3%	7.0%
Services	34.4%	38.5%	31.4%	33.7%
Public Administration	2.2%	1.5%	3.9%	4.1%

Notes: LEHD data above are for workers from California, Illinois, Maryland, and North Carolina in 1992 and 1997 employed at the end of the first quarter. Data were not available for Florida, Minnesota, and Texas (see Table 1) in both of these years. Demographic characteristics and industry affiliation were added through linkages with other Census Bureau and LEHD data bases. Education has been imputed using statistical matching procedures. An "Exiter" refers to individuals present in 1992 but not in 1997, "Entrant" was present in 1997 but not 1992, and a "Continuer" was present in both years. Unlike in earlier tables, individuals with valid person and firm effects can appear multiple times in a single year if they hold multiple jobs. Person and Firm effects are expressed as deviations from their grand (pooled) means. The grand means of h and $x_1\beta_1$ are 10.25222 and 1.598018 respectively.

Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Table 11: Industry Mean Values for Labor Force Exiters, Entrants, and Continuers

	(1) Exiters 1992	(2) Entrants 1997	(3) Continuers 1992	(4) Continuers 1997
Construction:				
N	255,362	320,115	758,145	788,700
Annualized Wage ($1994)	$32,176	$25,537	$38,073	$40,883
Age	39.69	32.73	35.93	39.94
Education	11.69	11.63	11.93	12.06
Male	0.79	0.79	0.82	0.83
Experience (Years)	22.81	15.31	18.92	22.29
White	0.76	0.63	0.75	0.74
Person Effect (θ)	-0.24	0.15	0.10	0.13
Overall Human Capital (h)	10.23	10.20	10.44	10.67
Firm Effect (ψ)	0.06	0.07	0.10	0.12
Manufacturing:				
N	827,086	876,482	2,754,584	2,676,590
Annualized Wage ($1994)	$35,521	$27,841	$38,008	$42,357
Age	42.55	32.41	37.37	41.55
Education	12.07	11.93	12.35	12.41
Male	0.59	0.60	0.66	0.66
Experience (Years)	25.36	14.98	19.97	23.79
White	0.67	0.48	0.65	0.64
Person Effect (θ)	-0.32	0.13	0.00	0.02
Overall Human Capital (h)	10.22	10.12	10.35	10.59
Firm Effect (ψ)	0.18	0.12	0.22	0.21
Transportation, Communications, Utilities:				
N	280,775	308,570	922,419	962,476
Annualized Wage ($1994)	$39,736	$29,922	$43,190	$45,947
Age	41.76	33.16	37.43	41.14
Education	12.40	12.07	12.61	12.61
Male	0.64	0.63	0.68	0.69
Experience (Years)	24.23	15.44	19.76	23.16
White	0.73	0.58	0.71	0.69
Person Effect (θ)	-0.23	0.18	0.08	0.11
Overall Human Capital (h)	10.29	10.22	10.44	10.66
Firm Effect (ψ)	0.18	0.10	0.23	0.21
Wholesale Trade:				
N	355,871	405,448	1,101,725	1,051,723
Annualized Wage ($1994)	$40,365	$33,058	$42,887	$48,300
Age	40.54	32.82	36.60	40.74
Education	12.47	12.16	12.65	12.65
Male	0.63	0.62	0.69	0.69
Experience (Years)	22.94	15.11	18.90	22.71
White	0.73	0.57	0.72	0.71
Person Effect (θ)	-0.14	0.23	0.14	0.16
Overall Human Capital (h)	10.29	10.24	10.44	10.68
Firm Effect (ψ)	0.16	0.12	0.19	0.19

Table 11 (Continued): Industry Mean Values for Labor Force Exiters, Entrants, and Continuers

	(1) Exiters 1992	(2) Entrants 1997	(3) Continuers 1992	(4) Continuers 1997
Retail Trade:				
N	796,382	1,234,701	1,758,549	1,534,847
Annualized Wage ($1994)	$19,716	$16,108	$24,624	$29,174
Age	36.69	30.07	33.05	39.23
Education	12.12	11.80	12.27	12.39
Male	0.47	0.48	0.57	0.58
Experience (Years)	19.46	12.93	15.76	21.37
White	0.68	0.57	0.67	0.67
Person Effect (θ)	-0.20	0.16	0.14	0.12
Overall Human Capital (h)	9.98	9.97	10.19	10.53
Firm Effect (ψ)	-0.25	-0.26	-0.20	-0.17
Finance, Insurance, Real Estate:				
N	338,389	356,701	961,375	928,595
Annualized Wage ($1994)	$38,383	$32,217	$42,287	$49,618
Age	39.52	32.47	35.79	40.29
Education	13.11	12.50	13.34	13.24
Male	0.36	0.38	0.37	0.39
Experience (Years)	21.30	14.47	17.40	21.70
White	0.76	0.64	0.72	0.72
Person Effect (θ)	-0.08	0.26	0.23	0.24
Overall Human Capital (h)	10.19	10.17	10.35	10.62
Firm Effect (ψ)	0.10	0.11	0.13	0.14
Services:				
N	1,618,123	2,358,738	4,164,092	4,469,754
Annualized Wage ($1994)	$30,149	$25,189	$36,788	$39,623
Age	40.57	33.81	37.36	41.59
Education	13.32	12.66	13.57	13.31
Male	0.39	0.40	0.42	0.42
Experience (Years)	22.12	15.47	18.73	22.84
White	0.71	0.58	0.69	0.68
Person Effect (θ)	-0.21	0.13	0.14	0.14
Overall Human Capital (h)	10.11	10.11	10.35	10.58
Firm Effect (ψ)	-0.05	-0.05	-0.01	0.00

Notes: LEHD data above are for workers from California, Illinois, Maryland, and North Carolina in 1992 and 1997 employed at the end of the first quarter. Data were not available for Florida, Minnesota, and Texas (see Table 1) in both of these years. Demographic characteristics and industry affiliation were added through linkages with other Census Bureau and LEHD data bases. Education has been imputed using statistical matching procedures. An "Exiter" refers to individuals present in 1992 but not in 1997, "Entrant" was present in 1997 but not 1992, and a "Continuer" was present in both years. Unlike in earlier tables, individuals with valid person and firm effects can appear multiple times in a single year if they hold multiple jobs. Person and Firm effects are expressed as deviations from their grand (pooled) means. The grand means of h and x1β1 are 10.25222 and 1.598018 respectively.
Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Table 12: 1992 Average Percentage of Establishment Level Employment Within Each Decile of the Human Capital Distribution

			Decile of the Human Capital Distribution									
Industry Title	SIC	Firms	1	2	3	4	5	6	7	8	9	10
All Sectors	All	362,004	15.1%	10.7%	9.9%	9.5%	9.3%	8.9%	8.5%	8.2%	8.4%	11.5%
Building contractors	15	8,616	10.9%	7.4%	7.6%	8.4%	9.2%	9.9%	10.4%	10.7%	11.2%	14.2%
Heavy construction	16	2,881	8.5%	6.4%	7.1%	8.3%	9.9%	11.2%	12.0%	12.0%	11.7%	12.8%
Special trade contractors	17	23,330	10.1%	7.6%	8.1%	9.0%	10.0%	10.8%	11.2%	11.2%	10.8%	11.2%
Food manufacturing	20	2,461	16.3%	11.8%	10.4%	9.9%	9.6%	9.0%	8.2%	7.5%	7.5%	9.8%
Textile mill products	22	1,105	14.6%	10.9%	9.3%	8.6%	8.3%	8.2%	8.3%	8.8%	10.0%	12.9%
Apparel	23	4,110	34.2%	18.3%	11.5%	8.1%	6.2%	5.0%	4.3%	3.9%	3.9%	4.7%
Lumber and wood	24	2,534	12.7%	10.5%	10.3%	10.1%	9.8%	9.4%	9.0%	8.7%	8.9%	10.6%
Furniture and fixtures	25	1,714	14.4%	12.5%	11.1%	10.1%	9.3%	8.6%	8.1%	8.0%	8.3%	9.8%
Paper and allied products	26	870	11.9%	11.0%	10.7%	10.5%	10.3%	9.6%	8.8%	8.1%	8.0%	11.0%
Printing and publishing	27	6,132	12.3%	8.9%	9.0%	9.5%	9.8%	9.8%	9.6%	9.5%	9.5%	12.1%
Chemicals and allied products	28	1,493	11.2%	8.9%	8.9%	9.3%	9.6%	9.6%	9.2%	9.0%	9.7%	14.7%
Petroleum and coal products	29	166	8.3%	7.0%	7.7%	8.9%	10.0%	10.7%	11.0%	10.8%	10.6%	15.0%
Rubber and plastics	30	2,154	17.0%	13.0%	11.2%	10.0%	9.0%	8.1%	7.5%	7.2%	7.3%	9.6%
Leather	31	196	24.2%	16.3%	12.2%	9.5%	7.8%	6.3%	5.4%	5.2%	5.7%	7.4%
Stone, clay and glass	32	1,493	11.9%	10.0%	10.0%	10.3%	10.5%	10.1%	9.5%	9.0%	8.8%	9.9%
Primary metals	33	941	10.6%	10.6%	11.2%	11.4%	11.1%	10.3%	9.2%	8.4%	7.9%	9.2%
Fabricated metals	34	4,834	12.2%	10.5%	10.3%	10.3%	10.2%	9.8%	9.2%	8.8%	8.5%	10.2%
Machinery, except electrical	35	6,407	9.5%	7.9%	8.2%	8.8%	9.5%	10.1%	10.4%	10.8%	11.3%	13.5%
Electric and electronic equipment	36	3,202	14.0%	12.1%	10.8%	9.9%	9.2%	8.5%	7.9%	7.8%	8.5%	11.4%
Transportation equipment	37	1,669	11.9%	10.8%	10.7%	10.7%	10.6%	10.2%	9.5%	8.7%	8.1%	8.9%
Instruments and related products	38	1,810	11.7%	9.8%	9.3%	9.3%	9.3%	9.1%	9.0%	9.2%	10.1%	13.2%
Miscellaneous manufacturing	39	1,441	18.4%	13.3%	11.2%	10.2%	9.2%	8.2%	7.4%	6.8%	6.5%	8.9%
Local and interurban passenger transport	41	1,211	14.2%	11.1%	11.2%	11.0%	10.6%	9.8%	8.9%	8.0%	7.4%	7.9%
Trucking and warehousing	42	6,724	10.2%	8.2%	8.9%	10.2%	11.5%	11.9%	11.1%	9.8%	9.0%	9.4%
Water transportation	44	449	10.1%	7.4%	7.7%	8.1%	8.8%	9.4%	10.0%	10.7%	11.9%	16.0%
Air transportation	45	674	10.3%	8.2%	9.0%	9.8%	10.2%	10.4%	10.3%	10.0%	10.1%	11.7%
Transportation services	47	2,869	11.9%	9.9%	10.8%	11.7%	11.6%	10.5%	9.1%	8.0%	7.5%	9.1%
Communication	48	1,656	10.7%	8.1%	8.4%	8.8%	9.2%	9.5%	9.6%	9.7%	10.6%	15.4%
Electric, gas and sanitary services	49	1,428	8.4%	7.1%	8.0%	9.6%	11.2%	11.9%	11.8%	11.2%	10.4%	10.5%
Wholesale trade-durable goods	50	24,351	10.6%	8.3%	8.5%	8.8%	9.1%	9.2%	9.2%	9.5%	10.5%	16.1%
Wholesale trade-nondurable goods	51	13,664	13.3%	9.7%	9.1%	9.0%	9.1%	8.9%	8.6%	8.4%	9.2%	14.8%
Building materials and garden supplies	52	4,158	13.1%	9.6%	9.5%	9.7%	9.8%	9.5%	9.0%	8.7%	9.1%	11.9%
General merchandise stores	53	743	18.9%	12.2%	10.2%	9.0%	8.2%	7.5%	7.0%	7.3%	8.4%	11.3%
Food stores	54	7,191	22.2%	15.0%	12.1%	10.2%	8.7%	7.4%	6.4%	5.7%	5.5%	6.8%
Automobile dealers and service stations	55	11,195	13.6%	10.5%	9.8%	9.4%	9.3%	9.2%	9.1%	9.1%	9.3%	10.7%
Apparel and accessory stores	56	3,387	20.4%	12.3%	10.2%	9.2%	8.4%	7.8%	7.2%	6.8%	7.1%	10.5%
Furniture and home furnishing stores	57	5,763	13.3%	9.6%	9.4%	9.5%	9.6%	9.4%	9.1%	8.9%	9.2%	12.0%
Eating and drinking places	58	26,028	24.1%	16.1%	12.8%	10.6%	8.7%	7.1%	5.8%	5.0%	4.5%	5.2%
Miscellaneous retail	59	12,683	18.4%	11.6%	10.2%	9.4%	8.7%	7.9%	7.2%	6.9%	7.4%	12.2%
Banking	60	3,140	12.9%	12.0%	11.5%	10.8%	9.8%	8.7%	7.7%	7.1%	7.6%	12.0%
Credit agencies other than banks	61	1,856	10.4%	8.7%	9.2%	9.6%	9.7%	9.3%	8.8%	8.6%	9.4%	16.4%
Security, commodity, brokers and services	62	1,275	8.5%	6.4%	6.9%	7.5%	8.0%	7.9%	7.8%	8.1%	9.9%	29.1%
Insurance carriers	63	1,490	8.7%	8.8%	9.6%	9.9%	9.8%	9.5%	9.1%	9.0%	9.8%	15.6%
Insurance agents and brokers	64	4,276	11.7%	8.8%	9.0%	9.4%	9.4%	9.0%	8.4%	8.1%	8.9%	17.3%
Real estate	65	9,224	15.2%	10.3%	9.9%	9.8%	9.5%	8.9%	8.4%	8.0%	8.2%	11.8%
Holding and other investments	67	866	10.8%	7.6%	7.8%	8.0%	8.2%	8.2%	8.4%	8.7%	9.9%	22.5%
Hotel and lodging services	70	3,517	24.9%	15.5%	12.1%	10.0%	8.4%	6.9%	5.9%	5.3%	5.1%	5.9%
Personal services	72	6,796	22.5%	14.0%	11.1%	9.4%	8.3%	7.3%	6.6%	6.1%	6.2%	8.5%
Business services	73	21,676	14.6%	10.8%	10.0%	9.6%	9.3%	8.9%	8.6%	8.4%	8.7%	11.1%
Auto repair services and garages	75	7,903	13.7%	10.8%	10.4%	10.4%	10.5%	10.4%	9.9%	8.9%	7.8%	7.2%
Miscellaneous repair	76	3,408	11.5%	9.1%	9.4%	10.0%	10.5%	10.7%	10.4%	9.7%	9.1%	9.6%
Motion pictures	78	2,019	18.0%	10.9%	9.0%	8.2%	7.8%	7.6%	7.4%	7.6%	8.5%	15.1%
Amusement and recreation services	79	5,139	19.1%	11.0%	9.7%	9.1%	8.7%	8.1%	7.6%	7.4%	7.9%	11.6%
Health services	80	27,202	17.8%	11.9%	10.6%	9.7%	8.8%	7.9%	6.9%	6.2%	6.0%	14.0%
Legal services	81	6,559	11.4%	8.8%	9.3%	9.9%	10.0%	9.2%	8.3%	8.0%	9.0%	16.0%
Educational services	82	5,824	14.3%	8.3%	7.9%	8.2%	8.8%	9.3%	9.8%	10.6%	11.7%	11.0%
Social services	83	8,153	20.8%	13.9%	11.8%	10.6%	9.5%	8.3%	7.2%	6.4%	5.8%	5.7%
Museums, botanical, zoological gardens	84	179	14.5%	8.7%	8.7%	9.2%	9.4%	9.1%	9.2%	9.4%	9.7%	12.0%
Membership organizations	86	4,863	13.2%	8.8%	8.8%	9.1%	9.5%	9.6%	9.5%	9.4%	9.6%	12.5%
Engineering, accounting, research services	87	15,764	9.9%	7.4%	7.7%	8.4%	9.1%	9.6%	9.8%	10.1%	11.1%	17.0%
Miscellaneous services	89	297	11.4%	8.3%	8.6%	9.0%	9.8%	9.9%	9.6%	9.5%	9.7%	14.0%

Notes: LEHD data above are for workers from California, Illinois, Maryland, and North Carolina in 1992, employed at the end of the first quarter. Mining, Agriculture, and Government SICs have been excluded.

Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Table 13: 1997 Average Percentage of Establishment Level Employment Within Each Decile of the Human Capital Distribution

			Decile of the Human Capital Distribution:									
Industry Title	SIC	Firms	1	2	3	4	5	6	7	8	9	10
All Sectors	All	402,535	7.3%	5.5%	6.2%	7.3%	8.6%	9.7%	11.0%	12.6%	14.3%	17.5%
Building contractors	15	10,117	5.9%	4.4%	5.3%	6.6%	8.3%	10.3%	12.4%	14.6%	15.9%	16.4%
Heavy construction	16	3,075	6.7%	5.5%	6.4%	7.7%	9.1%	10.4%	11.7%	13.2%	14.8%	14.6%
Special trade contractors	17	26,975	9.5%	8.5%	9.1%	9.7%	10.3%	10.4%	10.3%	10.1%	9.9%	12.2%
Food manufacturing	20	2,485	8.3%	8.5%	8.9%	9.1%	9.3%	9.2%	9.3%	10.0%	11.7%	15.9%
Textile mill products	22	1,080	21.1%	17.4%	14.4%	11.5%	8.9%	6.8%	5.4%	4.7%	4.5%	5.3%
Apparel	23	4,355	7.5%	7.2%	8.4%	9.5%	10.3%	10.7%	10.8%	10.9%	11.3%	13.4%
Lumber and wood	24	2,574	7.9%	8.9%	10.2%	10.7%	10.6%	10.2%	9.6%	9.5%	10.0%	12.2%
Furniture and fixtures	25	1,718	6.5%	7.1%	8.4%	9.8%	10.8%	11.2%	11.1%	10.7%	10.9%	13.6%
Paper and allied products	26	879	7.8%	6.0%	6.8%	8.0%	9.2%	10.1%	10.9%	11.8%	13.0%	16.5%
Printing and publishing	27	6,078	6.5%	6.2%	7.1%	8.4%	9.4%	10.2%	10.7%	11.4%	12.3%	17.8%
Chemicals and allied products	28	1,581	4.9%	3.9%	4.9%	6.4%	8.1%	9.6%	12.3%	15.2%	15.9%	18.8%
Petroleum and coal products	29	168	8.8%	9.4%	10.2%	10.7%	10.6%	10.0%	9.3%	9.0%	9.6%	12.4%
Rubber and plastics	30	2,323	13.0%	13.6%	13.1%	12.1%	10.3%	8.6%	7.5%	6.6%	6.4%	8.9%
Leather	31	192	6.9%	6.7%	7.7%	8.9%	10.0%	11.0%	11.8%	11.9%	12.0%	13.2%
Stone, clay and glass	32	1,522	5.8%	6.4%	8.3%	10.2%	11.8%	12.4%	11.8%	10.9%	10.6%	11.8%
Primary metals	33	1,006	6.7%	7.1%	8.5%	9.9%	10.9%	11.1%	10.9%	10.8%	11.1%	12.9%
Fabricated metals	34	5,087	5.9%	5.5%	6.7%	8.0%	9.3%	10.3%	11.1%	12.3%	14.0%	16.9%
Machinery, except electrical	35	7,258	7.4%	8.6%	9.6%	10.2%	10.3%	9.9%	9.4%	9.5%	10.7%	14.3%
Electric and electronic equipment	36	3,479	6.2%	6.9%	8.6%	10.1%	11.1%	11.6%	11.6%	11.5%	11.0%	11.4%
Transportation equipment	37	1,662	6.5%	6.7%	7.7%	8.6%	9.3%	9.7%	10.1%	10.9%	12.7%	17.7%
Instruments and related products	38	1,934	10.9%	9.7%	10.0%	10.4%	10.4%	9.9%	9.3%	8.9%	9.1%	11.4%
Miscellaneous manufacturing	39	1,640	8.6%	7.9%	9.0%	10.5%	11.5%	11.7%	11.1%	10.4%	9.6%	9.7%
Local and interurban passenger transport	41	1,412	6.0%	5.4%	6.6%	8.3%	10.3%	12.3%	13.7%	13.6%	12.2%	11.8%
Trucking and warehousing	42	7,525	7.0%	5.0%	5.7%	6.8%	8.1%	9.4%	10.7%	12.2%	14.4%	20.8%
Water transportation	44	501	6.9%	6.2%	7.5%	8.8%	9.9%	10.6%	11.0%	11.8%	13.0%	14.3%
Air transportation	45	768	7.5%	6.5%	8.0%	9.9%	11.5%	12.2%	11.8%	10.9%	9.9%	11.7%
Transportation services	47	3,367	7.4%	6.0%	7.0%	8.3%	9.4%	10.1%	10.4%	11.1%	12.5%	17.8%
Communication	48	2,089	4.8%	4.3%	5.6%	7.1%	9.2%	11.5%	13.4%	14.6%	15.2%	14.4%
Electric, gas and sanitary services	49	1,511	6.5%	5.8%	6.7%	8.0%	9.0%	9.8%	10.3%	11.1%	12.9%	20.0%
Wholesale trade-durable goods	50	26,316	8.6%	7.1%	7.7%	8.5%	9.2%	9.6%	10.0%	10.4%	11.2%	17.7%
Wholesale trade-nondurable goods	51	14,830	8.4%	6.5%	7.3%	8.4%	9.4%	10.2%	10.7%	11.1%	12.1%	16.0%
Building materials and garden supplies	52	4,088	13.7%	10.3%	9.9%	9.5%	9.1%	8.7%	8.2%	8.2%	9.0%	13.3%
General merchandise stores	53	727	15.2%	11.8%	11.5%	11.2%	10.3%	9.0%	7.9%	7.2%	7.1%	8.6%
Food stores	54	7,486	8.9%	7.6%	8.4%	9.1%	9.4%	9.5%	9.9%	10.8%	12.0%	14.4%
Automobile dealers and service stations	55	11,401	15.2%	10.1%	9.6%	9.4%	9.1%	8.7%	8.3%	8.1%	8.6%	13.0%
Apparel and accessory stores	56	3,088	8.9%	7.0%	7.7%	8.8%	9.6%	10.1%	10.2%	10.5%	11.6%	15.6%
Furniture and home furnishing stores	57	6,343	15.6%	12.3%	12.3%	11.9%	11.0%	9.5%	7.9%	6.7%	6.0%	6.6%
Eating and drinking places	58	29,332	12.7%	8.8%	9.0%	9.3%	9.5%	9.3%	8.8%	8.7%	9.2%	14.7%
Miscellaneous retail	59	13,102	7.7%	7.9%	9.3%	10.4%	10.8%	10.4%	9.6%	9.1%	9.5%	15.1%
Banking	60	2,761	6.2%	5.4%	6.5%	8.0%	9.3%	10.1%	10.4%	10.8%	12.1%	21.3%
Credit agencies other than banks	61	2,260	6.2%	5.0%	5.9%	7.0%	8.1%	8.9%	9.3%	9.7%	11.2%	28.7%
Security, commodity, brokers and services	62	1,895	4.7%	4.6%	6.2%	8.0%	9.6%	10.5%	11.0%	11.7%	13.1%	20.4%
Insurance carriers	63	1,607	7.5%	5.9%	6.8%	8.1%	9.2%	9.9%	10.1%	10.2%	11.1%	21.2%
Insurance agents and brokers	64	4,342	10.0%	7.4%	8.1%	9.2%	10.0%	10.2%	10.0%	9.8%	10.3%	15.0%
Real estate	65	9,564	7.4%	5.5%	6.2%	7.4%	8.5%	9.1%	9.4%	10.1%	11.5%	24.8%
Holding and other investments	67	1,011	16.1%	12.8%	12.1%	11.4%	10.4%	9.1%	7.7%	6.7%	6.4%	7.3%
Hotel and lodging services	70	3,693	14.1%	11.1%	11.0%	10.7%	10.0%	9.0%	8.2%	7.8%	7.8%	10.3%
Personal services	72	7,388	8.5%	7.3%	8.2%	9.1%	9.7%	10.0%	10.0%	10.4%	11.6%	15.1%
Business services	73	28,198	8.2%	7.4%	8.3%	9.4%	10.3%	10.8%	11.2%	11.8%	11.8%	10.8%
Auto repair services and garages	75	9,838	7.1%	6.1%	7.1%	8.3%	9.7%	10.8%	11.7%	12.6%	13.1%	13.4%
Miscellaneous repair	76	3,798	12.4%	8.2%	8.1%	8.4%	8.7%	9.0%	9.0%	9.0%	9.9%	17.1%
Motion pictures	78	2,214	14.0%	8.7%	8.7%	9.0%	9.2%	9.1%	8.9%	8.9%	9.5%	13.9%
Amusement and recreation services	79	6,250	11.3%	8.7%	9.1%	9.7%	9.9%	9.5%	8.9%	8.4%	8.3%	16.3%
Health services	80	29,596	7.6%	5.8%	6.6%	7.9%	9.5%	10.5%	10.6%	10.2%	10.8%	20.5%
Legal services	81	6,695	11.9%	7.2%	7.3%	8.0%	8.6%	9.2%	9.8%	10.8%	12.9%	14.3%
Educational services	82	6,634	15.0%	11.9%	11.6%	11.4%	10.7%	9.6%	8.4%	7.5%	6.9%	6.8%
Social services	83	10,142	12.7%	7.8%	7.7%	8.5%	9.5%	10.1%	10.1%	9.9%	10.5%	13.2%
Museums, botanical, zoological gardens	84	227	9.6%	6.4%	6.9%	8.0%	9.0%	9.9%	10.7%	11.5%	12.4%	15.6%
Membership organizations	86	5,179	6.7%	5.3%	6.0%	7.2%	8.5%	9.5%	10.3%	11.5%	13.7%	21.5%
Engineering, accounting, research services	87	18,647	8.0%	6.4%	7.2%	8.3%	9.4%	10.2%	10.3%	10.6%	11.5%	18.0%
Miscellaneous services	89	424	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Notes: LEHD data above are for workers from California, Illinois, Maryland, and North Carolina in 1997, employed at the end of the first quarter. Mining, Agriculture, and Government SICs have been excluded.
Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Table 14: 1992 Heterogeneity of Establishment Level Employment Within Each Decile of the Human Capital Distribution

		Decile of the Human Capital Distribution:									
Industry Title	SIC	1	2	3	4	5	6	7	8	9	10
All Sectors in Economic Censuses	All	0.135	0.075	0.058	0.050	0.047	0.048	0.050	0.055	0.068	0.130
Building contractors	15	0.110	0.056	0.049	0.048	0.049	0.050	0.054	0.059	0.073	0.141
Heavy construction	16	0.091	0.049	0.043	0.045	0.048	0.053	0.056	0.059	0.072	0.132
Special trade contractors	17	0.105	0.057	0.052	0.050	0.051	0.053	0.057	0.066	0.078	0.119
Food manufacturing	20	0.138	0.076	0.052	0.045	0.047	0.048	0.045	0.047	0.056	0.107
Textile mill products	22	0.128	0.064	0.046	0.036	0.030	0.032	0.035	0.043	0.060	0.100
Apparel	23	0.206	0.093	0.056	0.044	0.042	0.041	0.042	0.044	0.051	0.076
Lumber and wood	24	0.105	0.073	0.062	0.052	0.050	0.048	0.050	0.055	0.070	0.115
Furniture and fixtures	25	0.129	0.088	0.063	0.050	0.043	0.044	0.047	0.055	0.072	0.111
Paper and allied products	26	0.111	0.066	0.052	0.045	0.042	0.041	0.040	0.044	0.054	0.099
Printing and publishing	27	0.112	0.058	0.050	0.047	0.045	0.045	0.046	0.051	0.064	0.124
Chemicals and allied products	28	0.115	0.062	0.047	0.043	0.042	0.044	0.045	0.046	0.060	0.132
Petroleum and coal products	29	0.103	0.048	0.046	0.046	0.048	0.050	0.052	0.054	0.063	0.128
Rubber and plastics	30	0.132	0.070	0.051	0.045	0.039	0.040	0.038	0.045	0.055	0.093
Leather	31	0.180	0.088	0.063	0.049	0.045	0.043	0.042	0.046	0.068	0.098
Stone, clay and glass	32	0.121	0.077	0.058	0.053	0.055	0.052	0.053	0.058	0.072	0.109
Primary metals	33	0.105	0.069	0.056	0.049	0.047	0.047	0.046	0.050	0.061	0.099
Fabricated metals	34	0.115	0.067	0.053	0.045	0.043	0.044	0.046	0.050	0.059	0.104
Machinery, except electrical	35	0.100	0.060	0.049	0.046	0.044	0.046	0.049	0.056	0.073	0.124
Electric and electronic equipment	36	0.124	0.074	0.054	0.043	0.039	0.039	0.039	0.046	0.064	0.111
Transportation equipment	37	0.107	0.071	0.055	0.047	0.046	0.045	0.047	0.051	0.061	0.100
Instruments and related products	38	0.115	0.066	0.047	0.041	0.041	0.039	0.041	0.048	0.065	0.112
Miscellaneous manufacturing	39	0.149	0.078	0.053	0.050	0.044	0.043	0.047	0.050	0.056	0.101
Local and interurban passenger transport	41	0.113	0.070	0.061	0.052	0.046	0.046	0.050	0.053	0.067	0.103
Trucking and warehousing	42	0.107	0.066	0.058	0.058	0.063	0.064	0.063	0.067	0.081	0.123
Water transportation	44	0.099	0.057	0.050	0.045	0.045	0.044	0.050	0.056	0.073	0.154
Air transportation	45	0.105	0.060	0.057	0.056	0.050	0.050	0.058	0.059	0.077	0.142
Transportation services	47	0.120	0.066	0.062	0.064	0.059	0.054	0.050	0.052	0.063	0.113
Communication	48	0.091	0.053	0.046	0.041	0.041	0.041	0.044	0.047	0.062	0.134
Electric, gas and sanitary services	49	0.094	0.060	0.053	0.054	0.061	0.059	0.064	0.069	0.081	0.132
Wholesale trade-durable goods	50	0.106	0.060	0.052	0.048	0.046	0.045	0.046	0.052	0.069	0.148
Wholesale trade-nondurable goods	51	0.127	0.071	0.055	0.049	0.047	0.048	0.048	0.051	0.067	0.149
Building materials and garden supplies	52	0.117	0.063	0.054	0.050	0.050	0.048	0.048	0.050	0.067	0.128
General merchandise stores	53	0.133	0.068	0.055	0.040	0.036	0.034	0.034	0.042	0.062	0.123
Food stores	54	0.144	0.085	0.062	0.051	0.045	0.042	0.043	0.045	0.055	0.098
Automobile dealers and service stations	55	0.118	0.071	0.058	0.048	0.044	0.043	0.047	0.053	0.066	0.112
Apparel and accessory stores	56	0.149	0.077	0.056	0.047	0.041	0.040	0.040	0.046	0.060	0.132
Furniture and home furnishing stores	57	0.118	0.065	0.056	0.052	0.049	0.047	0.047	0.053	0.070	0.130
Eating and drinking places	58	0.141	0.080	0.059	0.049	0.042	0.039	0.037	0.039	0.045	0.074
Miscellaneous retail	59	0.140	0.074	0.057	0.050	0.045	0.043	0.043	0.046	0.059	0.136
Banking	60	0.091	0.059	0.048	0.040	0.036	0.033	0.033	0.034	0.043	0.106
Credit agencies other than banks	61	0.094	0.054	0.048	0.047	0.043	0.039	0.038	0.043	0.056	0.134
Security, commodity, brokers and services	62	0.086	0.045	0.047	0.042	0.045	0.038	0.037	0.038	0.053	0.192
Insurance carriers	63	0.081	0.053	0.051	0.048	0.043	0.042	0.040	0.043	0.060	0.134
Insurance agents and brokers	64	0.109	0.055	0.050	0.048	0.045	0.043	0.039	0.044	0.059	0.141
Real estate	65	0.133	0.069	0.057	0.052	0.046	0.045	0.047	0.051	0.064	0.139
Holding and other investments	67	0.115	0.061	0.054	0.046	0.040	0.039	0.045	0.047	0.060	0.198
Hotel and lodging services	70	0.148	0.076	0.055	0.043	0.037	0.035	0.037	0.042	0.053	0.092
Personal services	72	0.174	0.091	0.065	0.053	0.050	0.047	0.048	0.052	0.064	0.127
Business services	73	0.135	0.079	0.060	0.051	0.046	0.046	0.051	0.059	0.074	0.127
Auto repair services and garages	75	0.130	0.078	0.063	0.056	0.056	0.060	0.063	0.065	0.071	0.099
Miscellaneous repair	76	0.118	0.069	0.059	0.057	0.057	0.057	0.058	0.062	0.074	0.119
Motion pictures	78	0.152	0.082	0.054	0.043	0.040	0.041	0.043	0.050	0.065	0.155
Amusement and recreation services	79	0.131	0.062	0.049	0.041	0.038	0.037	0.038	0.042	0.055	0.121
Health services	80	0.132	0.073	0.059	0.051	0.046	0.042	0.042	0.045	0.053	0.147
Legal services	81	0.101	0.055	0.049	0.050	0.048	0.043	0.040	0.042	0.052	0.135
Educational services	82	0.105	0.051	0.044	0.042	0.043	0.043	0.043	0.051	0.072	0.110
Social services	83	0.151	0.081	0.057	0.049	0.046	0.044	0.045	0.048	0.056	0.083
Museums, botanical, zoological gardens	84	0.103	0.043	0.040	0.044	0.043	0.036	0.038	0.044	0.056	0.114
Membership organizations	86	0.129	0.065	0.056	0.052	0.051	0.053	0.058	0.062	0.076	0.146
Engineering, accounting, research services	87	0.102	0.055	0.048	0.045	0.045	0.046	0.046	0.051	0.067	0.150
Miscellaneous services	89	0.107	0.062	0.053	0.041	0.051	0.049	0.047	0.050	0.066	0.140

Notes: LEHD data above are for workers from California, Illinois, Maryland, and North Carolina in 1997, employed at the end of the first quarter. Mining, Agriculture, and Government SICs have been excluded. The above table shows the standard deviation of the percentage of employees in establishments within each decile of the overall distribution of human capital.
Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Table 15: 1997 Heterogeneity of Establishment Level Employment Within Each Decile of the Human Capital Distribution

		Decile of the Human Capital Distribution:									
Industry Title	SIC	1	2	3	4	5	6	7	8	9	10
All Sectors in Economic Censuses	All	0.104	0.064	0.059	0.055	0.052	0.051	0.053	0.062	0.079	0.146
Building contractors	15	0.085	0.047	0.044	0.046	0.049	0.050	0.054	0.066	0.084	0.155
Heavy construction	16	0.076	0.038	0.038	0.042	0.044	0.050	0.057	0.070	0.086	0.139
Special trade contractors	17	0.080	0.046	0.046	0.049	0.051	0.053	0.057	0.069	0.094	0.133
Food manufacturing	20	0.102	0.066	0.057	0.051	0.049	0.050	0.057	0.061	0.067	0.117
Textile mill products	22	0.082	0.072	0.056	0.046	0.041	0.035	0.038	0.048	0.066	0.122
Apparel	23	0.158	0.098	0.072	0.055	0.047	0.045	0.045	0.049	0.058	0.086
Lumber and wood	24	0.078	0.060	0.061	0.058	0.053	0.054	0.057	0.065	0.076	0.130
Furniture and fixtures	25	0.089	0.073	0.070	0.064	0.053	0.051	0.051	0.059	0.080	0.133
Paper and allied products	26	0.076	0.058	0.052	0.049	0.048	0.047	0.050	0.050	0.064	0.118
Printing and publishing	27	0.087	0.048	0.045	0.045	0.046	0.045	0.048	0.056	0.073	0.137
Chemicals and allied products	28	0.080	0.056	0.051	0.050	0.047	0.049	0.052	0.064	0.075	0.148
Petroleum and coal products	29	0.097	0.035	0.038	0.042	0.054	0.045	0.061	0.085	0.101	0.150
Rubber and plastics	30	0.088	0.065	0.054	0.049	0.046	0.044	0.044	0.047	0.061	0.108
Leather	31	0.112	0.088	0.074	0.063	0.050	0.050	0.050	0.053	0.067	0.115
Stone, clay and glass	32	0.087	0.064	0.057	0.055	0.050	0.055	0.064	0.066	0.083	0.127
Primary metals	33	0.078	0.054	0.053	0.053	0.055	0.058	0.056	0.056	0.076	0.114
Fabricated metals	34	0.078	0.056	0.054	0.053	0.052	0.049	0.052	0.056	0.071	0.118
Machinery, except electrical	35	0.075	0.048	0.048	0.048	0.049	0.048	0.050	0.059	0.080	0.142
Electric and electronic equipment	36	0.084	0.072	0.061	0.052	0.048	0.045	0.045	0.053	0.071	0.130
Transportation equipment	37	0.073	0.057	0.056	0.054	0.053	0.052	0.054	0.063	0.072	0.116
Instruments and related products	38	0.081	0.059	0.051	0.046	0.043	0.041	0.043	0.057	0.074	0.136
Miscellaneous manufacturing	39	0.117	0.073	0.060	0.053	0.052	0.050	0.050	0.058	0.071	0.119
Local and interurban passenger transport	41	0.083	0.057	0.055	0.056	0.053	0.052	0.054	0.061	0.070	0.117
Trucking and warehousing	42	0.077	0.051	0.052	0.056	0.062	0.068	0.077	0.082	0.092	0.138
Water transportation	44	0.082	0.043	0.042	0.044	0.045	0.052	0.055	0.065	0.082	0.180
Air transportation	45	0.076	0.050	0.053	0.054	0.053	0.052	0.052	0.067	0.090	0.147
Transportation services	47	0.095	0.052	0.056	0.057	0.059	0.058	0.058	0.060	0.068	0.126
Communication	48	0.080	0.047	0.046	0.046	0.046	0.047	0.046	0.056	0.073	0.147
Electric, gas and sanitary services	49	0.072	0.047	0.049	0.051	0.062	0.065	0.073	0.079	0.104	0.150
Wholesale trade-durable goods	50	0.079	0.051	0.049	0.050	0.049	0.049	0.049	0.056	0.077	0.164
Wholesale trade-nondurable goods	51	0.098	0.062	0.055	0.053	0.051	0.049	0.054	0.063	0.075	0.164
Building materials and garden supplies	52	0.088	0.049	0.049	0.049	0.047	0.051	0.053	0.055	0.073	0.142
General merchandise stores	53	0.095	0.061	0.056	0.048	0.045	0.043	0.038	0.050	0.061	0.132
Food stores	54	0.119	0.073	0.067	0.062	0.054	0.047	0.047	0.050	0.061	0.106
Automobile dealers and service stations	55	0.090	0.058	0.055	0.054	0.047	0.044	0.047	0.058	0.073	0.127
Apparel and accessory stores	56	0.124	0.067	0.056	0.052	0.046	0.046	0.046	0.051	0.065	0.146
Furniture and home furnishing stores	57	0.096	0.052	0.051	0.052	0.052	0.051	0.049	0.056	0.074	0.146
Eating and drinking places	58	0.117	0.068	0.062	0.055	0.050	0.047	0.044	0.045	0.050	0.083
Miscellaneous retail	59	0.113	0.063	0.057	0.053	0.050	0.049	0.048	0.052	0.065	0.144
Banking	60	0.075	0.049	0.050	0.047	0.043	0.039	0.037	0.040	0.051	0.123
Credit agencies other than banks	61	0.074	0.040	0.041	0.046	0.045	0.045	0.044	0.045	0.059	0.153
Security, commodity, brokers and services	62	0.078	0.043	0.044	0.045	0.046	0.045	0.042	0.047	0.060	0.196
Insurance carriers	63	0.066	0.038	0.041	0.045	0.048	0.046	0.049	0.053	0.070	0.156
Insurance agents and brokers	64	0.089	0.047	0.045	0.046	0.047	0.048	0.046	0.051	0.063	0.154
Real estate	65	0.104	0.057	0.054	0.054	0.054	0.053	0.051	0.057	0.072	0.153
Holding and other investments	67	0.097	0.053	0.047	0.049	0.050	0.047	0.043	0.055	0.062	0.198
Hotel and lodging services	70	0.116	0.069	0.058	0.049	0.044	0.040	0.037	0.042	0.053	0.103
Personal services	72	0.126	0.083	0.071	0.062	0.055	0.051	0.051	0.056	0.070	0.137
Business services	73	0.096	0.063	0.060	0.056	0.052	0.050	0.052	0.062	0.087	0.152
Auto repair services and garages	75	0.092	0.063	0.061	0.058	0.058	0.058	0.063	0.074	0.090	0.125
Miscellaneous repair	76	0.089	0.055	0.054	0.052	0.054	0.055	0.062	0.072	0.089	0.138
Motion pictures	78	0.125	0.066	0.054	0.050	0.046	0.049	0.046	0.051	0.064	0.158
Amusement and recreation services	79	0.111	0.052	0.050	0.047	0.044	0.041	0.043	0.046	0.058	0.128
Health services	80	0.105	0.061	0.056	0.054	0.054	0.050	0.047	0.051	0.062	0.163
Legal services	81	0.084	0.043	0.041	0.045	0.049	0.052	0.051	0.050	0.058	0.148
Educational services	82	0.094	0.045	0.041	0.042	0.043	0.041	0.042	0.048	0.071	0.126
Social services	83	0.122	0.078	0.063	0.056	0.051	0.049	0.048	0.050	0.061	0.092
Museums, botanical, zoological gardens	84	0.096	0.044	0.035	0.036	0.042	0.041	0.041	0.042	0.062	0.108
Membership organizations	86	0.107	0.055	0.050	0.051	0.051	0.056	0.064	0.078	0.091	0.160
Engineering, accounting, research services	87	0.081	0.046	0.044	0.045	0.047	0.047	0.049	0.057	0.077	0.165
Miscellaneous services	89	0.086	0.057	0.053	0.051	0.053	0.054	0.052	0.059	0.068	0.170

Notes: LEHD data above are for workers from California, Illinois, Maryland, and North Carolina in 1997, employed at the end of the first quarter. Mining, Agriculture, and Government SICs have been excluded. The above table shows the standard deviation of the percentage of employees in establishments within each decile of the overall distribution of human capital.
Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Table 16: 1992 Average Percentage of Establishment Level Employment in *Exiting Firms* Within Each Decile of the Human Capital Distribution

			Decile of the Human Capital Distribution:									
Industry Title	SIC	Firms	1	2	3	4	5	6	7	8	9	10
All Sectors in Economic Censuses	All	136,092	12.4%	8.1%	8.2%	8.8%	9.5%	10.0%	10.2%	10.2%	10.3%	12.4%
Building contractors	15	4,278	10.3%	7.2%	7.5%	8.5%	9.7%	11.1%	11.6%	11.3%	11.1%	11.7%
Heavy construction	16	1,031	12.0%	8.5%	8.8%	9.5%	10.3%	10.8%	10.8%	10.4%	9.6%	9.3%
Special trade contractors	17	9,191	18.7%	12.8%	11.0%	10.0%	9.4%	8.6%	7.6%	6.8%	6.7%	8.3%
Food manufacturing	20	739	16.6%	11.0%	9.5%	8.6%	8.3%	8.2%	8.3%	8.7%	9.6%	11.3%
Textile mill products	22	396	37.7%	18.9%	11.5%	7.8%	5.8%	4.5%	3.7%	3.3%	3.2%	3.6%
Apparel	23	2,209	14.5%	11.1%	10.7%	10.4%	10.1%	9.6%	9.1%	8.4%	7.9%	8.2%
Lumber and wood	24	904	16.8%	13.1%	11.1%	9.9%	8.9%	8.0%	7.7%	7.8%	8.2%	8.4%
Furniture and fixtures	25	597	12.5%	11.4%	11.1%	10.5%	10.0%	9.3%	8.4%	7.9%	8.4%	10.6%
Paper and allied products	26	226	13.8%	9.5%	9.5%	9.8%	10.1%	9.8%	9.3%	8.9%	8.8%	10.4%
Printing and publishing	27	2,163	11.8%	8.8%	8.8%	9.3%	9.6%	9.7%	9.4%	9.0%	9.9%	13.8%
Chemicals and allied products	28	460	7.9%	7.4%	8.6%	9.6%	10.4%	10.5%	10.8%	11.1%	10.4%	13.2%
Petroleum and coal products	29	44	18.6%	13.6%	11.6%	10.4%	9.1%	8.1%	7.2%	6.6%	6.6%	8.0%
Rubber and plastics	30	573	28.1%	16.4%	11.9%	9.0%	7.3%	5.9%	5.0%	4.7%	5.3%	6.5%
Leather	31	62	14.9%	11.3%	11.0%	10.9%	10.6%	9.6%	8.7%	8.0%	7.5%	7.5%
Stone, clay and glass	32	428	12.0%	11.1%	11.3%	11.2%	10.6%	9.8%	8.8%	8.2%	8.1%	8.8%
Primary metals	33	245	14.2%	11.4%	10.7%	10.4%	10.1%	9.7%	9.0%	8.2%	7.7%	8.5%
Fabricated metals	34	1,166	11.1%	8.7%	8.8%	9.1%	9.5%	10.0%	10.2%	10.5%	10.8%	11.5%
Machinery, except electrical	35	1,628	15.4%	11.8%	10.4%	9.4%	8.9%	8.3%	7.7%	7.9%	9.0%	11.3%
Electric and electronic equipment	36	988	13.0%	11.2%	10.9%	10.8%	10.6%	10.0%	9.1%	8.2%	7.8%	8.5%
Transportation equipment	37	524	12.7%	9.7%	9.0%	8.9%	9.0%	8.9%	8.9%	9.4%	10.7%	12.8%
Instruments and related products	38	535	21.3%	13.9%	11.2%	10.0%	9.0%	8.0%	7.1%	6.3%	5.9%	7.3%
Miscellaneous manufacturing	39	463	15.9%	11.9%	11.7%	11.0%	10.1%	8.9%	8.0%	7.6%	7.2%	7.6%
Local and interurban passenger transport	41	477	11.6%	8.9%	9.5%	10.5%	11.5%	11.5%	10.5%	9.3%	8.5%	8.4%
Trucking and warehousing	42	2,602	11.3%	7.7%	8.0%	8.5%	9.1%	9.6%	9.9%	10.1%	10.8%	15.0%
Water transportation	44	159	12.7%	8.5%	9.2%	9.6%	9.7%	9.7%	9.6%	9.2%	9.6%	12.2%
Air transportation	45	228	13.8%	10.6%	11.2%	11.8%	11.3%	10.1%	8.7%	7.5%	7.0%	8.0%
Transportation services	47	1,115	11.7%	8.5%	8.7%	9.0%	9.4%	9.4%	9.2%	9.3%	10.2%	14.5%
Communication	48	797	10.3%	8.6%	8.9%	10.0%	11.5%	11.6%	10.9%	9.8%	8.7%	9.7%
Electric, gas and sanitary services	49	388	11.9%	8.8%	8.8%	9.0%	9.3%	9.3%	9.2%	9.3%	10.2%	14.2%
Wholesale trade-durable goods	50	8,148	15.1%	10.2%	9.4%	9.1%	8.9%	8.6%	8.2%	8.1%	8.8%	13.6%
Wholesale trade-nondurable goods	51	4,777	15.1%	10.2%	9.9%	10.1%	9.9%	9.4%	8.7%	8.1%	8.4%	10.1%
Building materials and garden supplies	52	1,388	21.0%	12.2%	10.1%	8.8%	8.1%	7.5%	7.0%	7.1%	8.1%	10.1%
General merchandise stores	53	312	24.1%	15.6%	12.3%	10.2%	8.6%	7.2%	6.0%	5.3%	5.1%	5.7%
Food stores	54	3,083	15.8%	11.5%	10.6%	10.0%	9.6%	9.0%	8.5%	8.3%	8.2%	8.6%
Automobile dealers and service stations	55	3,858	22.2%	12.8%	10.4%	9.3%	8.3%	7.5%	6.9%	6.6%	6.6%	9.3%
Apparel and accessory stores	56	1,773	14.6%	10.2%	9.9%	9.9%	9.8%	9.5%	9.0%	8.6%	8.6%	10.0%
Furniture and home furnishing stores	57	2,371	25.7%	16.4%	12.9%	10.5%	8.6%	6.9%	5.6%	4.7%	4.2%	4.4%
Eating and drinking places	58	11,688	20.5%	12.3%	10.5%	9.5%	8.6%	7.7%	7.0%	6.5%	6.8%	10.6%
Miscellaneous retail	59	5,387	13.8%	12.3%	11.6%	10.7%	9.8%	8.7%	7.5%	6.9%	7.3%	11.5%
Banking	60	914	10.9%	9.0%	9.5%	9.9%	10.0%	9.6%	9.0%	8.5%	8.9%	14.7%
Credit agencies other than banks	61	1,023	9.2%	6.8%	7.3%	7.7%	8.3%	8.2%	8.1%	8.2%	10.1%	25.9%
Security, commodity, brokers and services	62	490	9.7%	8.7%	9.5%	9.9%	9.8%	9.5%	8.9%	8.8%	9.7%	15.5%
Insurance carriers	63	449	13.3%	9.3%	9.3%	9.6%	9.5%	9.0%	8.2%	7.9%	8.5%	15.3%
Insurance agents and brokers	64	1,620	16.0%	10.6%	10.1%	9.8%	9.4%	8.8%	8.1%	7.7%	7.9%	11.6%
Real estate	65	4,106	12.0%	8.1%	7.8%	7.6%	7.6%	7.7%	7.9%	8.4%	9.8%	23.2%
Holding and other investments	67	347	26.6%	15.6%	12.0%	9.9%	8.2%	6.8%	5.8%	5.1%	4.8%	5.3%
Hotel and lodging services	70	1,471	24.9%	14.5%	11.3%	9.5%	8.3%	7.2%	6.3%	5.7%	5.5%	6.7%
Personal services	72	3,165	16.0%	11.2%	10.2%	9.7%	9.2%	8.7%	8.3%	8.2%	8.4%	10.2%
Business services	73	9,278	15.4%	11.5%	10.9%	10.7%	10.7%	10.2%	9.3%	8.2%	7.0%	6.0%
Auto repair services and garages	75	2,845	13.4%	9.8%	9.9%	10.3%	10.5%	10.4%	10.0%	9.0%	8.3%	8.5%
Miscellaneous repair	76	1,236	19.8%	11.7%	9.3%	8.1%	7.6%	7.3%	7.1%	7.1%	8.0%	14.0%
Motion pictures	78	1,045	21.7%	11.8%	10.1%	9.3%	8.7%	7.9%	7.2%	6.8%	6.9%	9.7%
Amusement and recreation services	79	1,812	19.0%	12.3%	10.8%	9.7%	8.7%	7.7%	6.8%	6.2%	6.0%	12.9%
Health services	80	10,494	13.5%	9.7%	9.8%	10.1%	9.9%	9.0%	8.2%	7.8%	8.4%	13.6%
Legal services	81	2,461	17.1%	10.0%	9.5%	9.4%	9.6%	9.5%	8.9%	8.5%	8.4%	9.2%
Educational services	82	986	24.1%	14.5%	11.6%	10.0%	8.9%	7.7%	6.7%	5.9%	5.4%	5.2%
Social services	83	2,234	17.7%	9.2%	9.4%	9.6%	8.9%	8.2%	8.6%	8.9%	8.3%	11.3%
Museums, botanical, zoological gardens	84	33	15.5%	9.6%	9.2%	9.2%	9.5%	9.5%	9.1%	8.7%	8.5%	11.1%
Membership organizations	86	1,252	11.2%	8.0%	8.1%	8.6%	9.1%	9.4%	9.5%	9.7%	10.7%	15.8%
Engineering, accounting, research services	87	6,061	13.7%	8.4%	8.5%	8.7%	9.8%	9.8%	9.2%	9.3%	9.9%	12.6%
Miscellaneous services	89	118	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Notes: LEHD data above are for workers from California, Illinois, Maryland, and North Carolina in 1997, employed at the end of the first quarter. Mining, Agriculture, and Government SICs have been excluded. An "exiting firm" is one present in 1992 but not in 1997.

Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Table 17: 1992 Average Percentage of Establishment Level Employment in *Continuing Firms* Within Each Decile of the Human Capital Distribution

		Decile of the Human Capital Distribution:									
Industry Title	SIC	1	2	3	4	5	6	7	8	9	10
All Sectors in Economic Censuses	All	9.5%	6.7%	7.1%	8.0%	8.9%	9.9%	10.7%	11.3%	12.0%	15.9%
Building contractors	15	7.5%	6.0%	6.8%	8.2%	9.9%	11.3%	12.2%	12.5%	12.0%	13.5%
Heavy construction	16	8.9%	7.0%	7.6%	8.6%	9.8%	10.8%	11.5%	11.8%	11.7%	12.4%
Special trade contractors	17	15.2%	11.3%	10.2%	9.9%	9.7%	9.1%	8.4%	7.8%	7.8%	10.4%
Food manufacturing	20	13.6%	10.8%	9.3%	8.6%	8.3%	8.2%	8.4%	8.9%	10.3%	13.8%
Textile mill products	22	30.1%	17.7%	11.5%	8.4%	6.7%	5.6%	4.9%	4.5%	4.6%	6.0%
Apparel	23	11.7%	10.2%	10.0%	9.9%	9.7%	9.4%	9.0%	8.8%	9.4%	12.0%
Lumber and wood	24	13.1%	12.2%	11.1%	10.1%	9.4%	8.9%	8.3%	8.0%	8.3%	10.5%
Furniture and fixtures	25	11.8%	10.8%	10.6%	10.6%	10.4%	9.7%	8.9%	8.1%	7.9%	11.2%
Paper and allied products	26	11.4%	8.6%	8.8%	9.3%	9.7%	9.8%	9.8%	9.7%	9.9%	13.1%
Printing and publishing	27	10.9%	8.9%	8.9%	9.3%	9.6%	9.5%	9.1%	9.0%	9.6%	15.1%
Chemicals and allied products	28	8.4%	6.8%	7.4%	8.6%	9.8%	10.8%	11.1%	10.8%	10.7%	15.7%
Petroleum and coal products	29	16.4%	12.8%	11.0%	9.9%	8.9%	8.1%	7.5%	7.4%	7.6%	10.2%
Rubber and plastics	30	22.5%	16.2%	12.3%	9.8%	8.0%	6.5%	5.6%	5.4%	5.9%	7.8%
Leather	31	10.7%	9.5%	9.6%	10.0%	10.4%	10.3%	9.8%	9.4%	9.3%	10.9%
Stone, clay and glass	32	10.1%	10.4%	11.2%	11.5%	11.3%	10.4%	9.4%	8.5%	7.8%	9.3%
Primary metals	33	11.6%	10.2%	10.2%	10.3%	10.2%	9.8%	9.3%	8.9%	8.7%	10.8%
Fabricated metals	34	9.0%	7.6%	8.0%	8.7%	9.5%	10.1%	10.5%	10.9%	11.5%	14.2%
Machinery, except electrical	35	13.4%	12.2%	11.0%	10.2%	9.4%	8.6%	7.9%	7.7%	8.2%	11.5%
Electric and electronic equipment	36	11.4%	10.6%	10.6%	10.6%	10.6%	10.3%	9.7%	8.9%	8.2%	9.1%
Transportation equipment	37	11.3%	9.9%	9.5%	9.5%	9.4%	9.2%	9.0%	9.2%	9.9%	13.3%
Instruments and related products	38	17.0%	13.0%	11.2%	10.2%	9.2%	8.3%	7.6%	7.0%	6.8%	9.7%
Miscellaneous manufacturing	39	13.0%	10.5%	10.9%	11.0%	10.9%	10.4%	9.5%	8.2%	7.5%	8.1%
Local and interurban passenger transport	41	9.3%	7.8%	8.6%	10.0%	11.5%	12.1%	11.4%	10.1%	9.3%	10.0%
Trucking and warehousing	42	9.5%	7.3%	7.6%	7.9%	8.6%	9.2%	10.1%	11.0%	12.4%	16.5%
Water transportation	44	9.1%	8.1%	9.0%	9.9%	10.5%	10.7%	10.7%	10.4%	10.3%	11.4%
Air transportation	45	10.7%	9.4%	10.6%	11.6%	11.7%	10.8%	9.4%	8.2%	7.8%	9.9%
Transportation services	47	9.7%	7.6%	8.1%	8.6%	9.1%	9.6%	9.9%	10.1%	11.0%	16.3%
Communication	48	7.7%	6.6%	7.7%	9.4%	11.0%	12.0%	12.1%	11.7%	11.0%	10.8%
Electric, gas and sanitary services	49	9.9%	8.1%	8.4%	8.7%	9.1%	9.2%	9.3%	9.6%	10.7%	17.1%
Wholesale trade-durable goods	50	12.3%	9.4%	8.9%	9.0%	9.2%	9.1%	8.8%	8.6%	9.4%	15.4%
Wholesale trade-nondurable goods	51	12.1%	9.2%	9.3%	9.5%	9.8%	9.6%	9.2%	9.0%	9.4%	12.8%
Building materials and garden supplies	52	17.3%	12.1%	10.3%	9.1%	8.3%	7.5%	7.1%	7.4%	8.6%	12.2%
General merchandise stores	53	20.8%	14.6%	12.0%	10.2%	8.8%	7.6%	6.7%	6.0%	5.9%	7.6%
Food stores	54	12.4%	10.0%	9.4%	9.2%	9.2%	9.3%	9.4%	9.5%	9.8%	11.8%
Automobile dealers and service stations	55	18.4%	11.8%	10.1%	9.1%	8.6%	8.0%	7.4%	7.1%	7.5%	11.9%
Apparel and accessory stores	56	12.3%	9.2%	9.1%	9.2%	9.4%	9.4%	9.2%	9.2%	9.7%	13.4%
Furniture and home furnishing stores	57	22.9%	15.9%	12.8%	10.7%	8.8%	7.2%	6.0%	5.1%	4.8%	5.8%
Eating and drinking places	58	16.8%	11.1%	10.0%	9.4%	8.8%	8.1%	7.5%	7.2%	7.8%	13.4%
Miscellaneous retail	59	12.5%	11.8%	11.5%	10.8%	9.9%	8.7%	7.8%	7.2%	7.6%	12.2%
Banking	60	9.6%	8.3%	8.8%	9.3%	9.3%	8.9%	8.6%	8.6%	10.0%	18.5%
Credit agencies other than banks	61	8.0%	6.1%	6.6%	7.3%	7.7%	7.7%	7.7%	8.0%	9.8%	31.0%
Security, commodity, brokers and services	62	8.3%	8.8%	9.6%	10.0%	9.9%	9.6%	9.2%	9.1%	9.9%	15.7%
Insurance carriers	63	10.7%	8.5%	8.8%	9.2%	9.3%	8.9%	8.5%	8.3%	9.2%	18.6%
Insurance agents and brokers	64	14.6%	10.1%	9.8%	9.8%	9.5%	9.1%	8.6%	8.2%	8.3%	12.0%
Real estate	65	9.9%	7.3%	7.7%	8.2%	8.5%	8.6%	8.8%	8.9%	9.9%	21.9%
Holding and other investments	67	23.7%	15.4%	12.3%	10.1%	8.5%	7.0%	6.0%	5.4%	5.2%	6.3%
Hotel and lodging services	70	20.4%	13.5%	10.9%	9.4%	8.4%	7.5%	6.8%	6.5%	6.7%	9.9%
Personal services	72	13.5%	10.5%	9.9%	9.6%	9.4%	9.0%	8.7%	8.6%	8.9%	11.9%
Business services	73	12.7%	10.4%	10.1%	10.2%	10.4%	10.5%	10.2%	9.3%	8.2%	7.9%
Auto repair services and garages	75	10.4%	8.7%	9.1%	9.9%	10.5%	10.9%	10.6%	10.1%	9.5%	10.3%
Miscellaneous repair	76	16.0%	10.0%	8.6%	8.3%	8.1%	7.9%	7.8%	8.1%	9.1%	16.2%
Motion pictures	78	17.6%	10.6%	9.4%	8.9%	8.7%	8.2%	7.8%	7.8%	8.5%	12.6%
Amusement and recreation services	79	17.1%	11.7%	10.6%	9.8%	8.9%	8.0%	7.0%	6.3%	6.0%	14.7%
Health services	80	10.2%	8.3%	9.0%	9.8%	10.0%	9.4%	8.4%	8.1%	9.4%	17.5%
Legal services	81	13.7%	8.0%	7.6%	8.0%	8.6%	9.3%	10.0%	11.1%	12.4%	11.4%
Educational services	82	19.6%	13.7%	11.9%	10.8%	9.7%	8.5%	7.4%	6.5%	6.0%	5.8%
Social services	83	13.7%	8.6%	8.5%	9.2%	9.6%	9.3%	9.3%	9.6%	10.0%	12.2%
Museums, botanical, zoological gardens	84	12.4%	8.5%	8.6%	9.1%	9.4%	9.6%	9.7%	9.6%	10.0%	13.0%
Membership organizations	86	9.0%	7.0%	7.5%	8.3%	9.1%	9.7%	9.9%	10.3%	11.4%	17.8%
Engineering, accounting, research services	87	9.9%	8.3%	8.7%	9.1%	9.7%	10.1%	9.9%	9.7%	9.6%	15.0%
Miscellaneous services	89	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

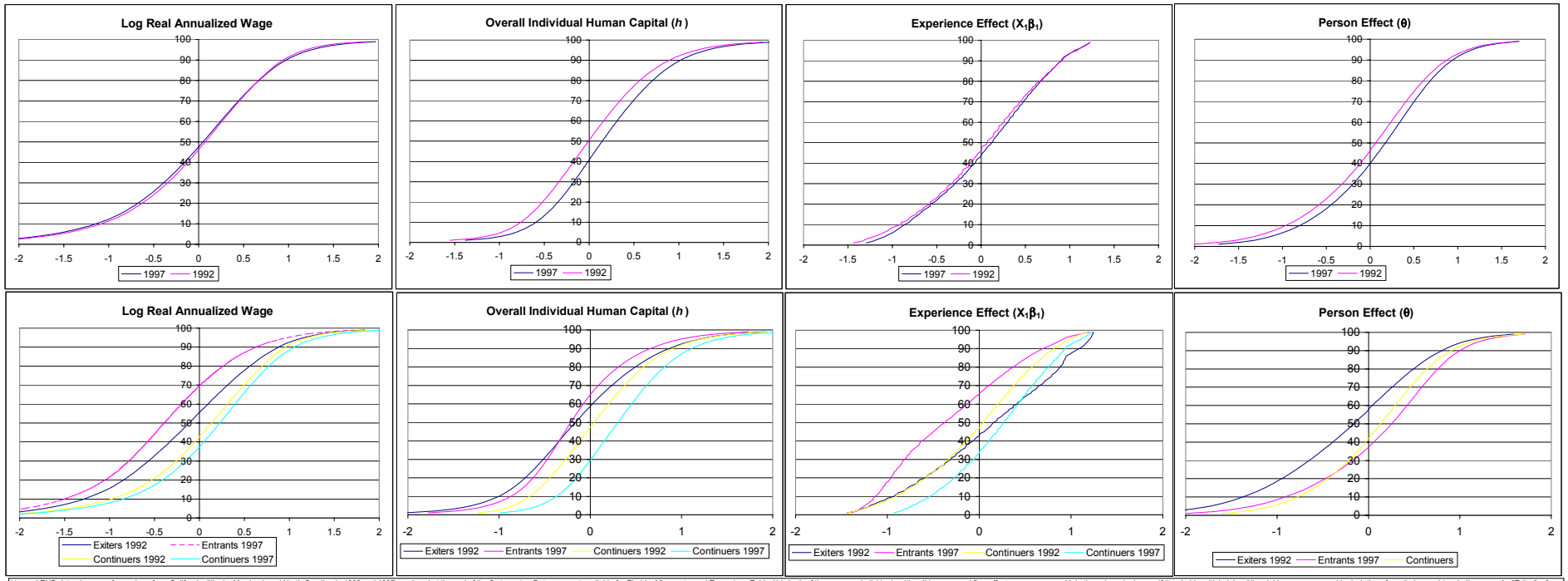
Notes: LEHD data above are for workers from California, Illinois, Maryland, and North Carolina in 1997, employed at the end of the first quarter. Mining, Agriculture, and Government SICs have been excluded. A continuing firm" is one present in both 1992 and 1997.
Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Table 18: 1997 Average Percentage of Establishment Level Employment in *Entering Firms* Within Each Decile of the Human Capital Distribution

			Decile of the Human Capital Distribution:									
Industry Title	SIC	Firms	1	2	3	4	5	6	7	8	9	10
All Sectors in Economic Censuses	All	176,623	8.4%	6.2%	6.8%	8.0%	9.2%	10.1%	11.0%	12.1%	13.2%	15.0%
Building contractors	15	5,779	7.4%	5.4%	6.1%	7.4%	8.9%	10.5%	12.0%	13.6%	14.2%	14.4%
Heavy construction	16	1,225	8.1%	6.3%	7.1%	8.4%	9.7%	10.7%	11.6%	12.5%	13.2%	12.5%
Special trade contractors	17	12,836	11.9%	9.3%	9.7%	10.2%	10.4%	10.0%	9.7%	9.3%	9.1%	10.5%
Food manufacturing	20	763	9.4%	9.7%	10.0%	9.8%	9.5%	8.8%	8.5%	8.9%	10.4%	15.1%
Textile mill products	22	371	24.5%	18.4%	14.9%	11.6%	8.6%	6.3%	4.7%	3.8%	3.5%	3.7%
Apparel	23	2,454	9.1%	8.0%	9.0%	9.9%	10.6%	11.1%	10.9%	10.4%	10.3%	10.7%
Lumber and wood	24	944	10.0%	10.5%	11.3%	11.6%	10.8%	9.9%	9.0%	8.3%	8.4%	10.2%
Furniture and fixtures	25	601	8.3%	7.8%	8.9%	10.0%	10.6%	10.5%	10.3%	9.5%	10.2%	13.8%
Paper and allied products	26	235	9.4%	6.7%	7.4%	8.5%	9.5%	10.2%	10.8%	11.2%	11.8%	14.5%
Printing and publishing	27	2,109	7.5%	6.5%	7.3%	8.6%	9.4%	9.7%	9.9%	10.9%	12.1%	18.1%
Chemicals and allied products	28	548	5.1%	3.7%	4.5%	6.2%	8.4%	8.6%	12.2%	17.6%	16.9%	16.7%
Petroleum and coal products	29	46	10.1%	9.4%	10.0%	10.6%	10.5%	9.8%	9.1%	8.8%	9.4%	12.2%
Rubber and plastics	30	742	16.0%	14.1%	12.7%	12.4%	10.1%	8.6%	7.4%	6.3%	5.4%	6.8%
Leather	31	58	9.4%	8.2%	8.7%	9.5%	10.2%	10.6%	10.7%	10.4%	10.3%	11.9%
Stone, clay and glass	32	457	7.4%	7.0%	8.5%	9.9%	11.0%	11.2%	10.7%	10.3%	10.8%	13.1%
Primary metals	33	310	8.1%	7.7%	8.9%	10.1%	10.7%	10.7%	10.7%	10.5%	10.7%	11.9%
Fabricated metals	34	1,419	7.5%	6.2%	7.2%	8.3%	9.5%	10.4%	10.8%	11.7%	13.0%	15.3%
Machinery, except electrical	35	2,479	8.7%	8.8%	9.4%	9.7%	9.7%	9.2%	8.8%	9.2%	11.0%	15.4%
Electric and electronic equipment	36	1,265	7.6%	7.5%	9.1%	10.3%	11.1%	11.5%	11.0%	10.7%	10.4%	11.0%
Transportation equipment	37	517	7.2%	6.5%	7.2%	8.0%	8.8%	9.2%	9.8%	11.0%	13.0%	19.3%
Instruments and related products	38	659	13.5%	10.4%	10.2%	10.4%	10.2%	9.5%	8.8%	8.5%	8.5%	10.0%
Miscellaneous manufacturing	39	662	9.8%	8.6%	9.5%	10.8%	11.6%	11.4%	10.4%	9.7%	9.1%	8.9%
Local and interurban passenger transport	41	678	6.8%	6.1%	7.3%	8.9%	10.8%	12.3%	13.1%	12.8%	11.5%	10.5%
Trucking and warehousing	42	3,403	7.6%	5.3%	5.9%	7.0%	8.3%	9.6%	10.7%	11.8%	13.9%	19.9%
Water transportation	44	211	8.6%	7.2%	8.1%	8.9%	9.4%	9.6%	10.4%	11.4%	12.4%	14.0%
Air transportation	45	322	8.9%	7.1%	8.4%	10.1%	11.3%	11.7%	11.3%	10.3%	9.6%	11.3%
Transportation services	47	1,613	7.8%	6.5%	7.5%	8.6%	9.6%	10.1%	10.3%	10.8%	12.1%	16.7%
Communication	48	1,230	6.2%	5.4%	6.4%	7.8%	9.8%	11.3%	12.2%	13.1%	13.9%	13.9%
Electric, gas and sanitary services	49	471	7.7%	6.4%	7.2%	8.2%	9.0%	9.5%	9.9%	10.6%	12.4%	19.1%
Wholesale trade-durable goods	50	10,113	10.2%	7.9%	8.3%	8.9%	9.3%	9.3%	9.3%	9.6%	10.4%	16.8%
Wholesale trade-nondurable goods	51	5,943	9.4%	7.0%	7.7%	8.6%	9.4%	10.0%	10.3%	10.7%	11.8%	15.0%
Building materials and garden supplies	52	1,318	15.2%	11.3%	10.5%	9.8%	9.2%	8.6%	8.0%	8.0%	8.2%	11.3%
General merchandise stores	53	296	16.9%	12.5%	12.0%	11.4%	10.3%	8.7%	7.5%	6.7%	6.5%	7.4%
Food stores	54	3,378	10.7%	8.6%	9.2%	9.8%	9.8%	9.6%	9.7%	10.1%	10.6%	12.0%
Automobile dealers and service stations	55	4,064	17.2%	10.9%	10.1%	9.7%	9.2%	8.6%	7.9%	7.6%	7.9%	10.9%
Apparel and accessory stores	56	1,474	9.9%	7.5%	8.3%	9.2%	9.9%	10.1%	9.9%	10.0%	10.9%	14.2%
Furniture and home furnishing stores	57	2,951	16.8%	12.6%	12.5%	12.0%	10.9%	9.4%	7.8%	6.5%	5.7%	5.9%
Eating and drinking places	58	14,992	14.1%	9.3%	9.4%	9.6%	9.6%	9.3%	8.7%	8.4%	8.8%	12.8%
Miscellaneous retail	59	5,806	9.2%	8.5%	9.5%	9.8%	10.0%	9.8%	9.2%	8.9%	9.7%	15.3%
Banking	60	535	6.9%	5.5%	6.5%	7.9%	9.1%	10.0%	10.3%	10.8%	12.1%	20.8%
Credit agencies other than banks	61	1,427	7.1%	5.7%	6.5%	7.4%	8.4%	9.0%	9.2%	9.7%	11.1%	25.8%
Security, commodity, brokers and services	62	1,110	6.1%	5.0%	6.2%	7.6%	9.1%	9.8%	10.4%	11.7%	13.0%	21.1%
Insurance carriers	63	566	9.2%	6.5%	7.3%	8.3%	9.2%	9.7%	9.8%	10.0%	10.7%	19.2%
Insurance agents and brokers	64	1,686	11.1%	7.8%	8.4%	9.3%	10.0%	10.0%	9.6%	9.4%	9.9%	14.5%
Real estate	65	4,446	8.7%	6.1%	6.6%	7.4%	8.3%	8.7%	9.1%	9.6%	10.9%	24.6%
Holding and other investments	67	492	17.5%	13.2%	12.0%	11.1%	10.1%	8.8%	7.5%	6.6%	6.2%	7.0%
Hotel and lodging services	70	1,647	15.3%	11.5%	11.4%	11.1%	10.3%	9.2%	8.2%	7.5%	7.2%	8.3%
Personal services	72	3,757	9.1%	7.4%	8.1%	8.9%	9.4%	9.7%	9.8%	10.4%	11.8%	15.3%
Business services	73	15,800	9.1%	7.9%	8.9%	9.8%	10.6%	10.9%	11.0%	11.2%	11.0%	9.6%
Auto repair services and garages	75	4,780	8.3%	6.8%	7.8%	8.8%	9.8%	10.7%	11.4%	12.0%	12.1%	12.1%
Miscellaneous repair	76	1,626	13.2%	8.6%	8.3%	8.5%	8.7%	8.9%	8.7%	8.8%	9.5%	16.7%
Motion pictures	78	1,240	15.7%	9.4%	9.1%	9.2%	9.3%	9.0%	8.6%	8.6%	8.8%	12.3%
Amusement and recreation services	79	2,923	12.2%	9.0%	9.3%	9.7%	9.8%	9.4%	8.7%	8.3%	8.3%	15.1%
Health services	80	12,888	9.1%	6.5%	7.1%	8.2%	9.5%	10.2%	10.2%	10.0%	10.6%	18.5%
Legal services	81	2,597	13.1%	8.1%	8.3%	9.0%	9.6%	9.7%	9.6%	9.8%	10.5%	12.3%
Educational services	82	1,796	17.4%	13.1%	12.2%	11.4%	10.2%	8.8%	7.6%	6.7%	6.3%	6.3%
Social services	83	4,223	14.9%	8.7%	8.2%	8.8%	9.9%	10.4%	9.8%	9.2%	9.6%	10.5%
Museums, botanical, zoological gardens	84	81	11.7%	7.2%	7.4%	8.3%	9.0%	9.7%	10.2%	10.7%	11.2%	14.6%
Membership organizations	86	1,568	7.6%	5.8%	6.5%	7.5%	8.6%	9.3%	10.0%	11.0%	13.2%	20.6%
Engineering, accounting, research services	87	8,944	9.6%	7.4%	7.9%	8.8%	9.6%	9.9%	9.6%	10.0%	10.9%	16.2%
Miscellaneous services	89	245	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

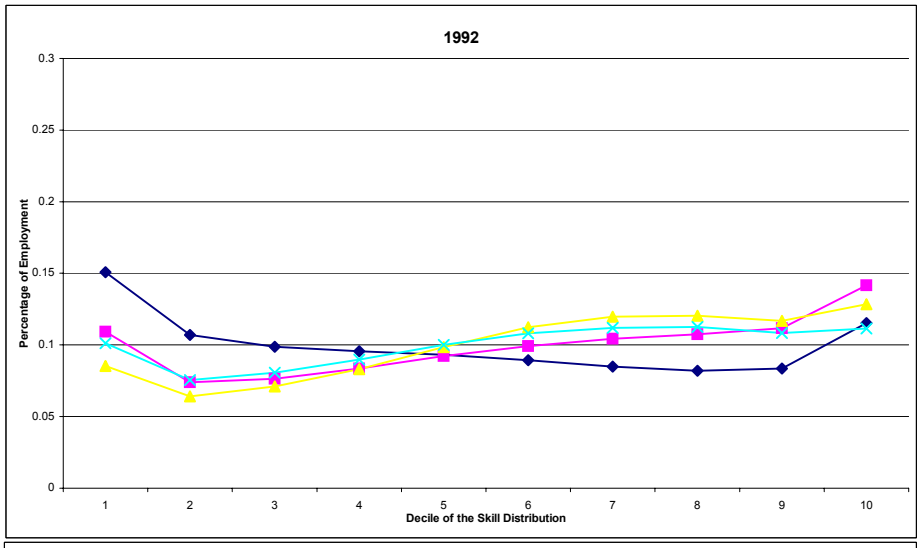
Notes: LEHD data above are for workers from California, Illinois, Maryland, and North Carolina in 1997, employed at the end of the first quarter. Mining, Agriculture, and Government SICs have been excluded. An "entering firm" is one present in 1997 but not in 1992.
Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

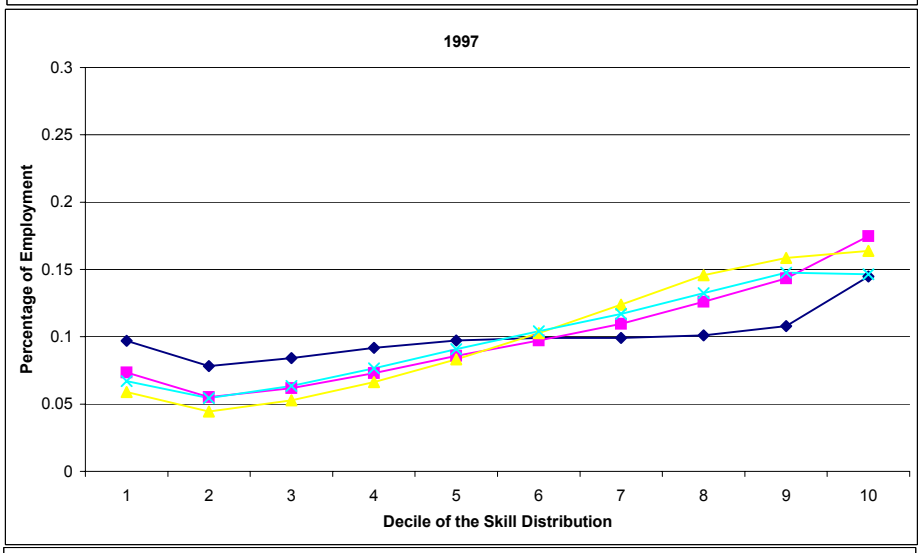
Figure 1: Cumulative Distribution of Selected Wage Components



Notes: LEHD data above are for workers from California, Illinois, Maryland, and North Carolina in 1992 and 1997 employed at the end of the first quarter. Data were not available for Florida, Minnesota, and Texas (see Table 1) in both of these years. Individuals with valid person and firm effects can appear multiple times in a single year if they hold multiple jobs. All variables are expressed in deviations from their grand (pooled) means. An "Exiter" refers to individuals present in 1992 but not in 1997, "Entrant" was present in 1997 but not 1992, and a "Continuer" was present in both years.
Sources: Author's calculations using the LEHD Program Employment Dynamics Estimates data base.

Figure 2A: Distribution of Human Capital for Construction





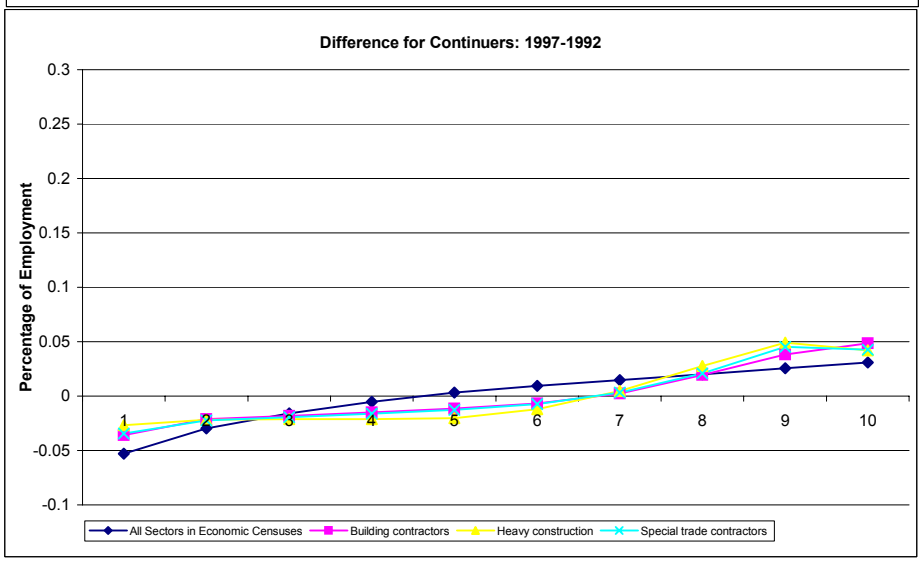


Figure 2B: Distribution of Human Capital for Construction

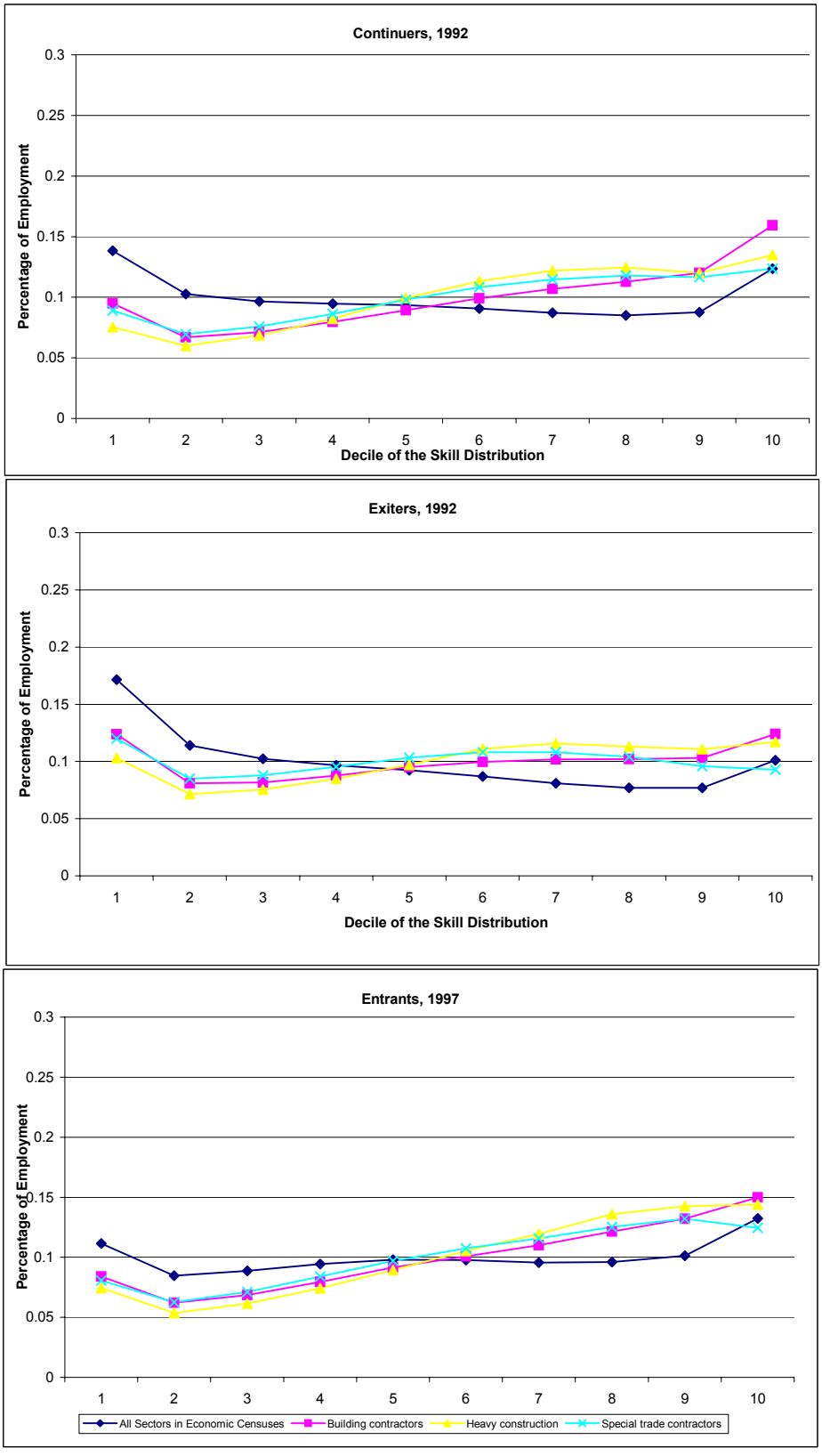


Figure 3A: Distribution of Human Capital for Manufacturing

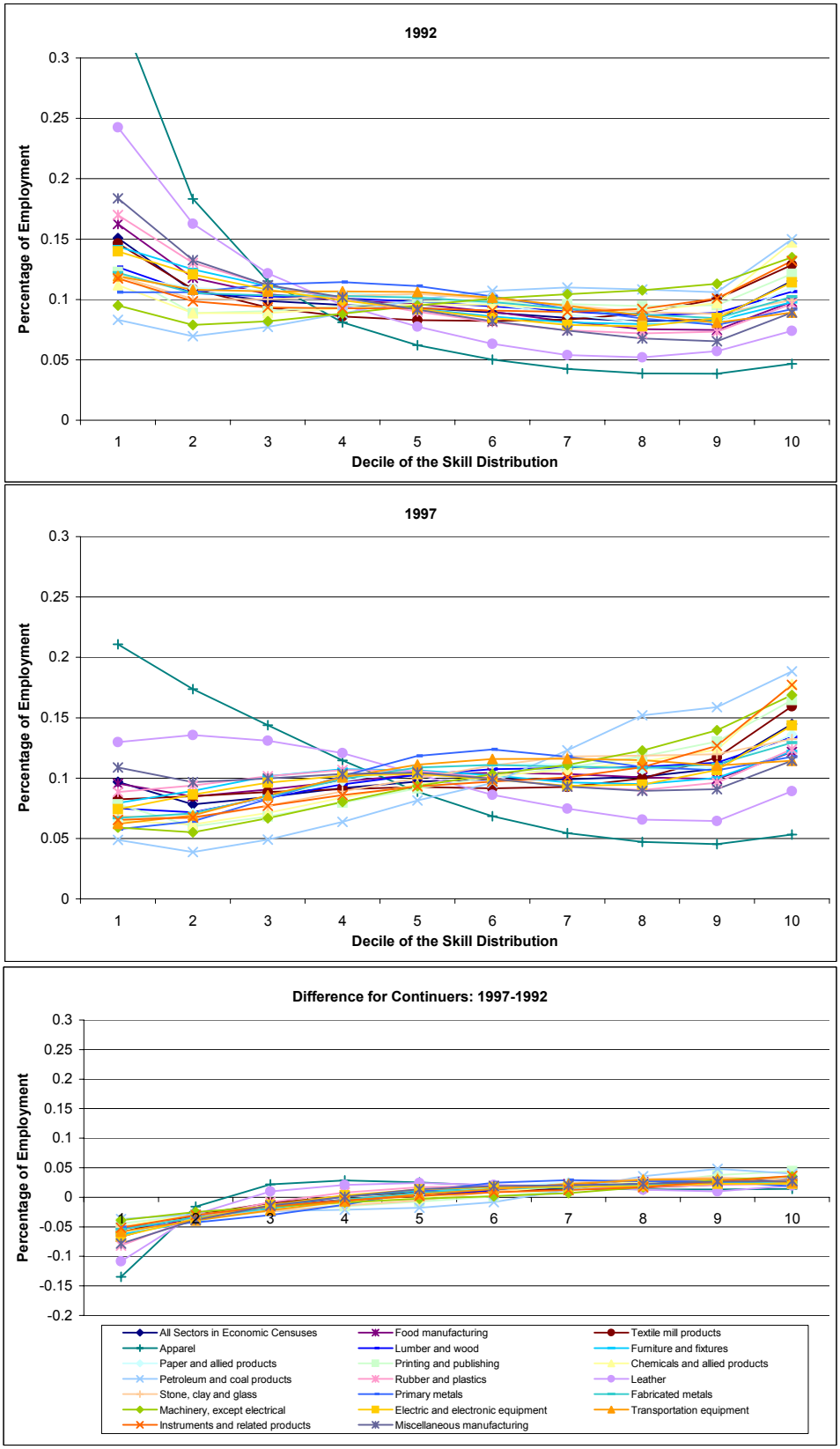


Figure 3B: Distribution of Human Capital for Manufacturing

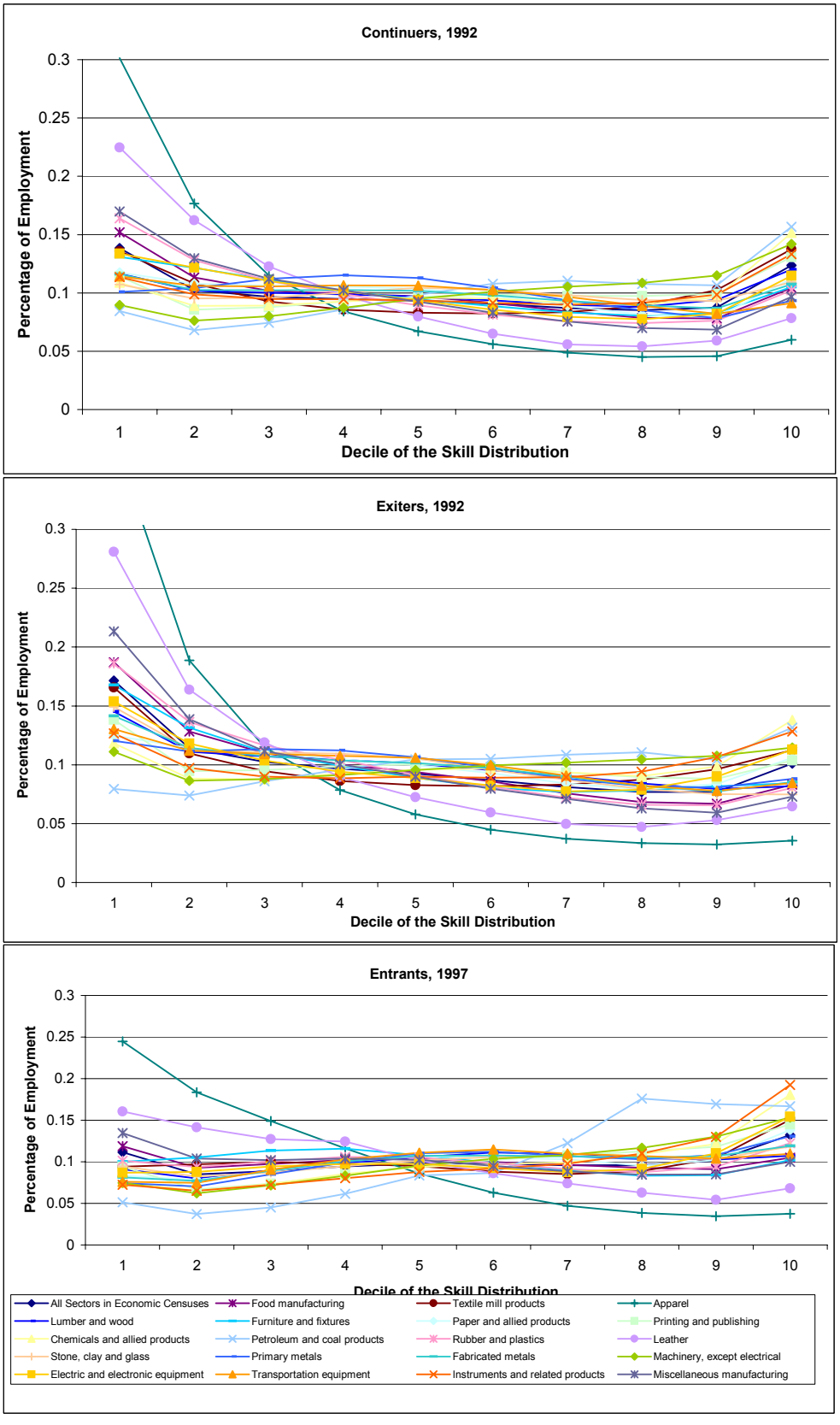
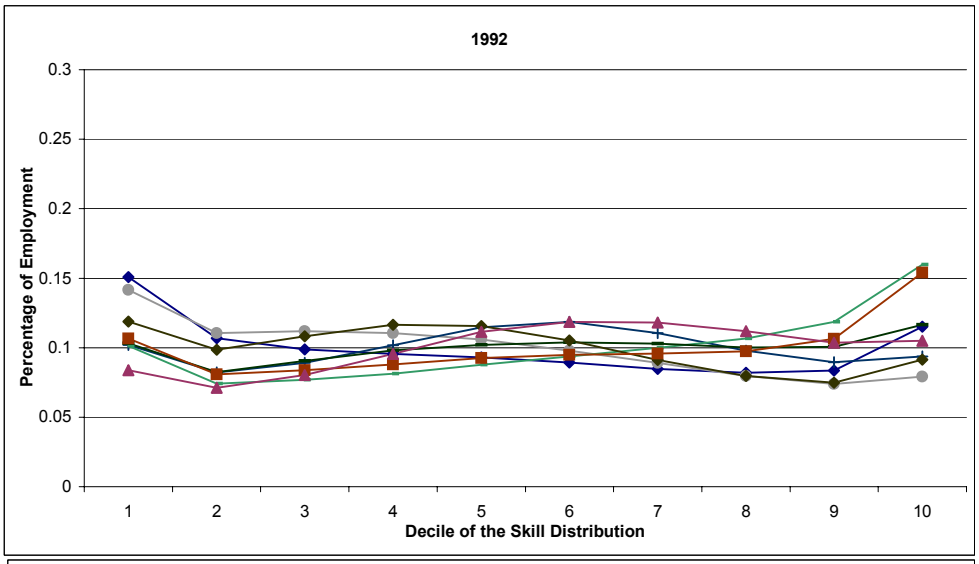
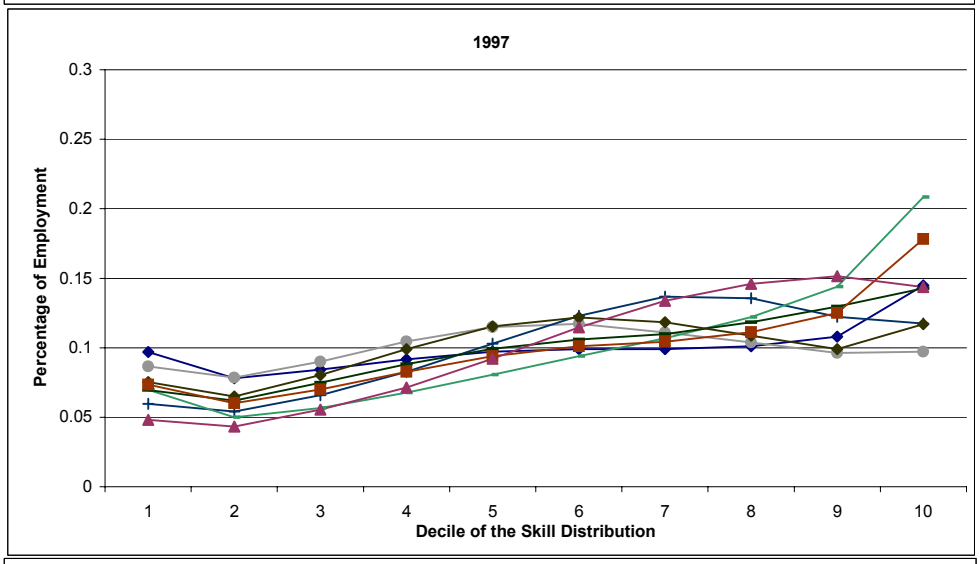


Figure 4A: Distribution of Human Capital for Transportation, Communications, and Utilities





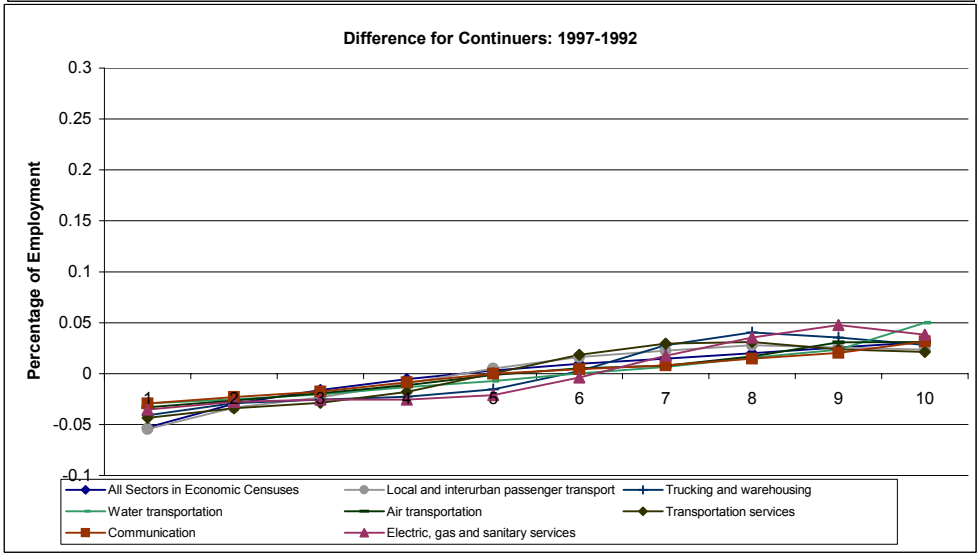
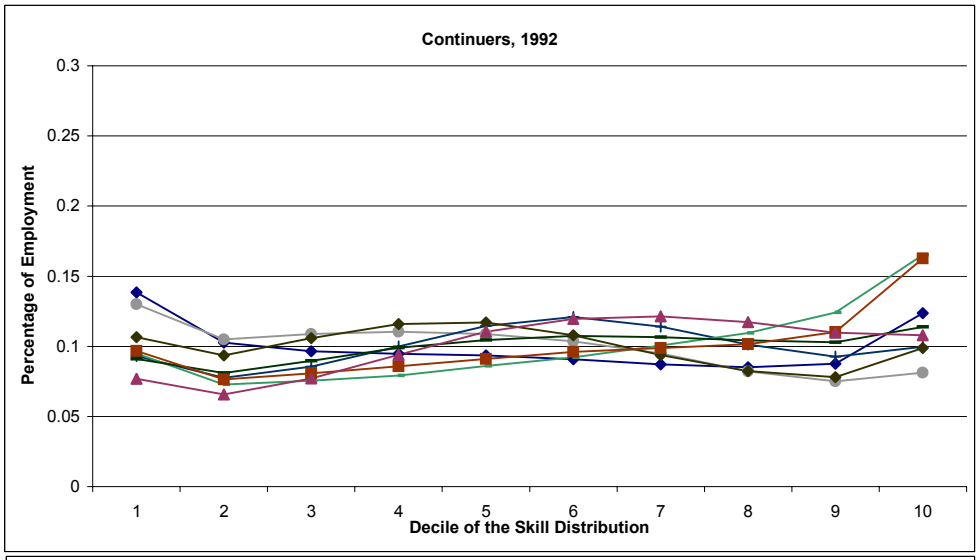
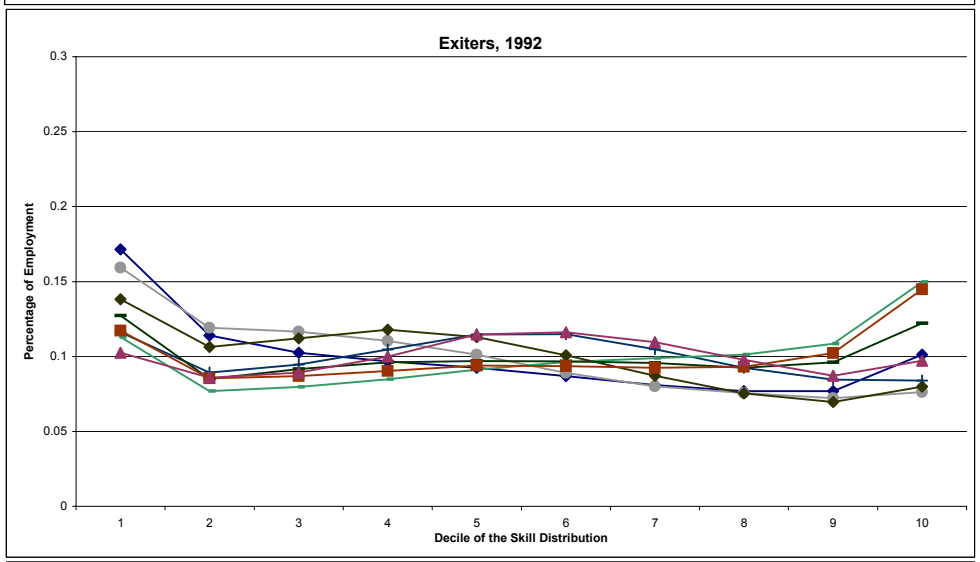


Figure 4B: Distribution of Human Capital for Transportation, Communications, and Utilities





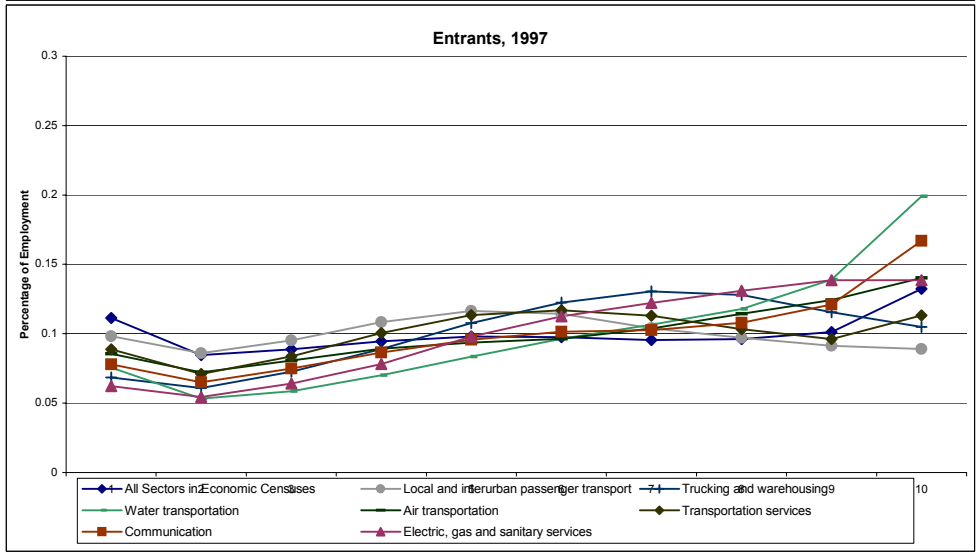
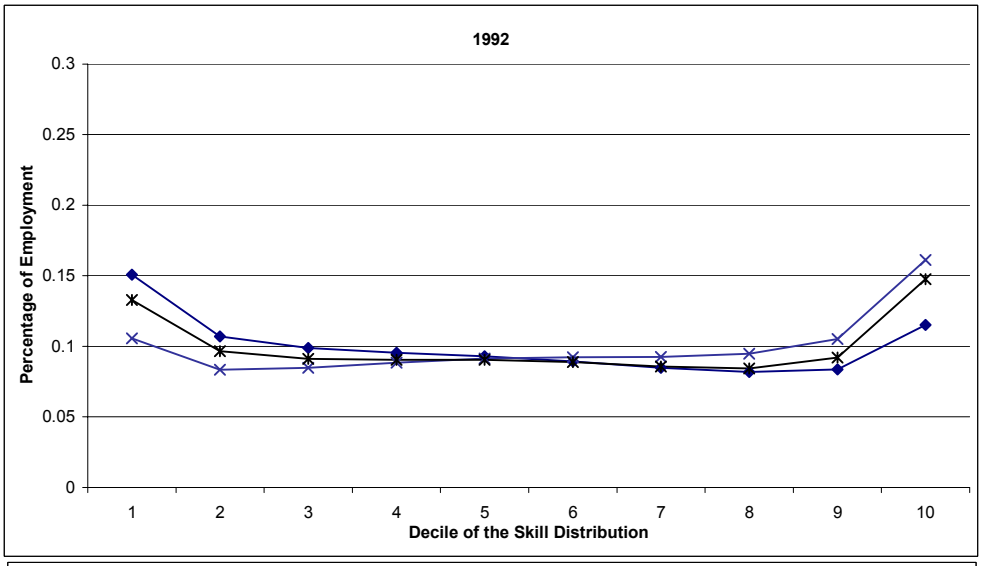
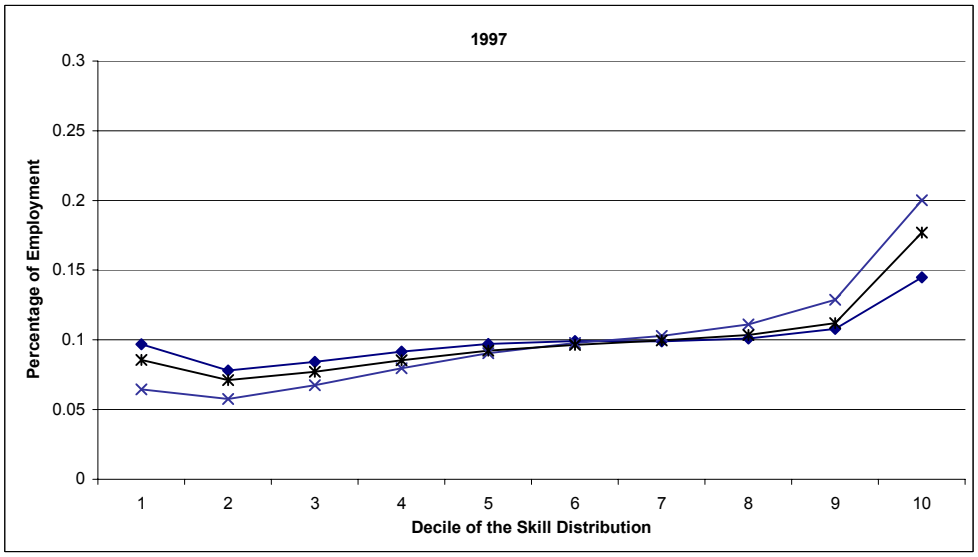


Figure 5A: Distribution of Human Capital for Wholesale





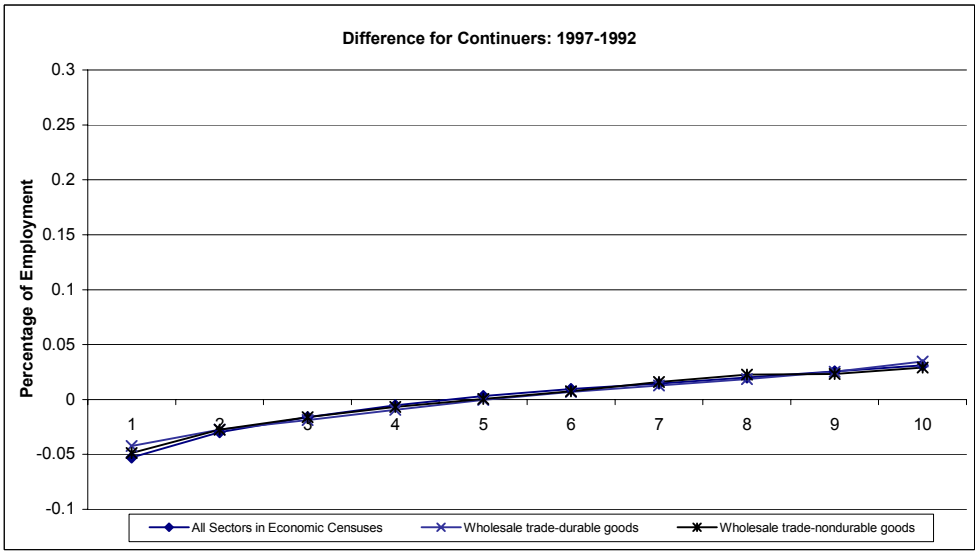


Figure 5B: Distribution of Human Capital for Wholesale

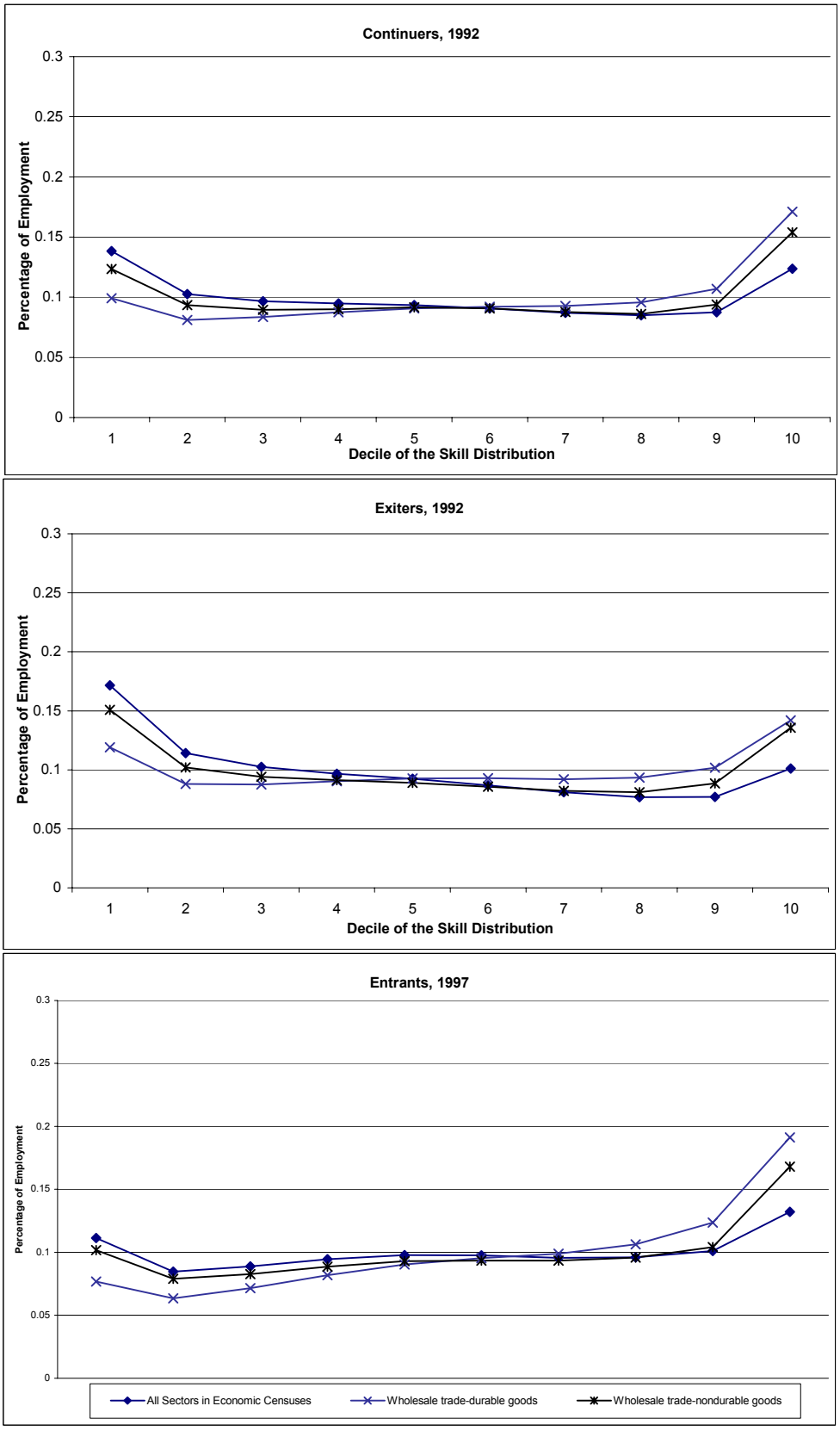


Figure 6A: Distribution of Human Capital for Retail Trade

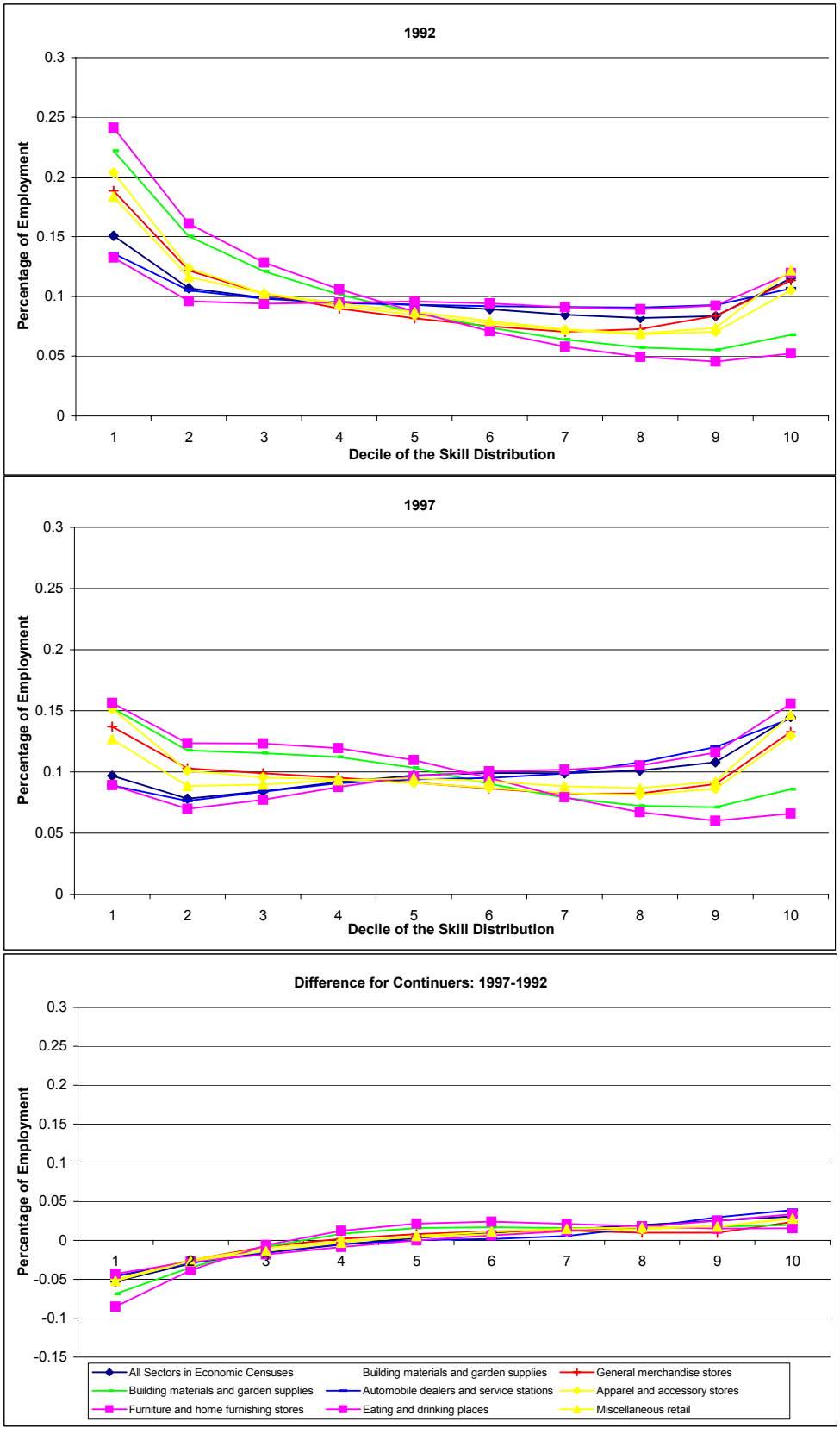


Figure 6B: Distribution of Human Capital for Retail Trade

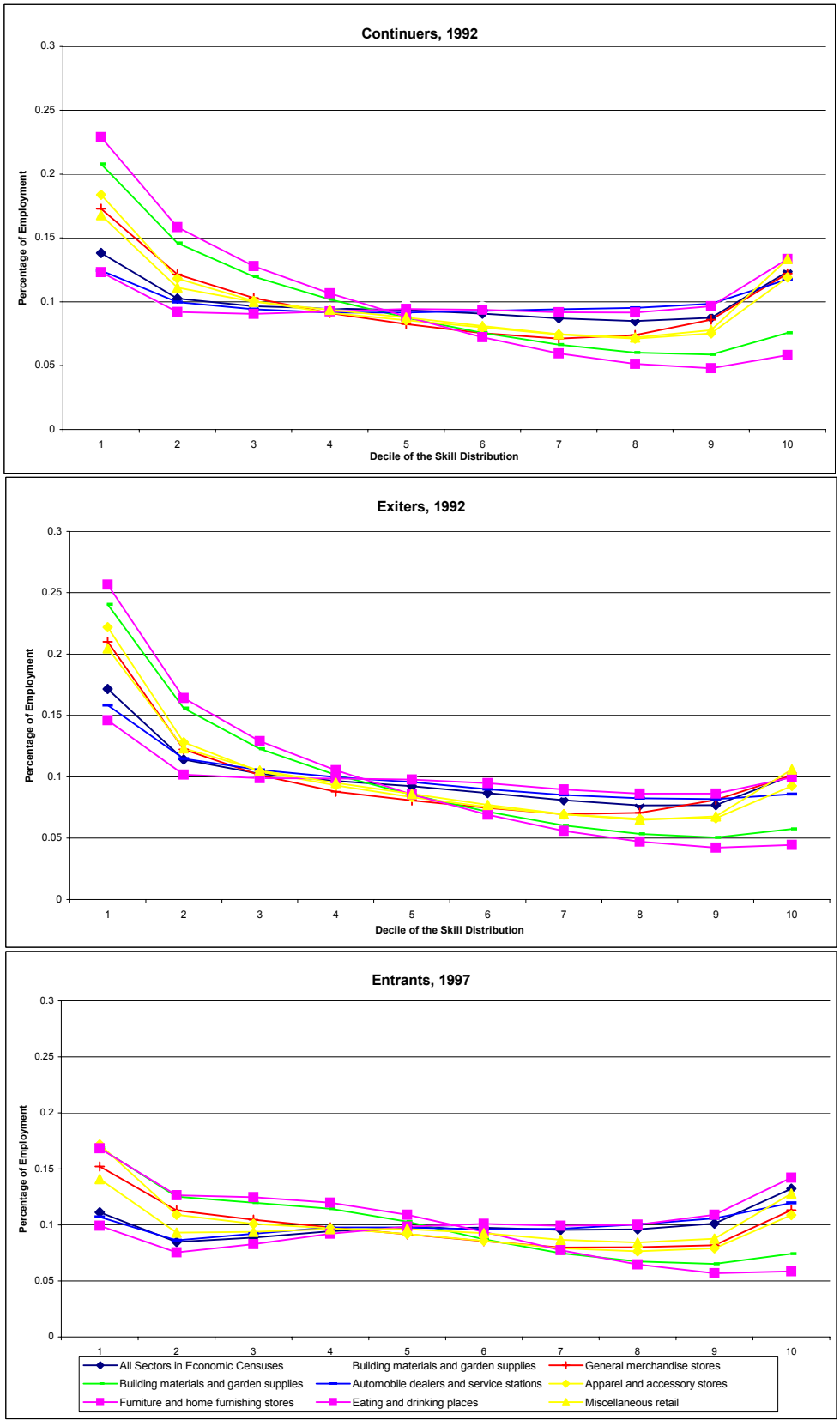
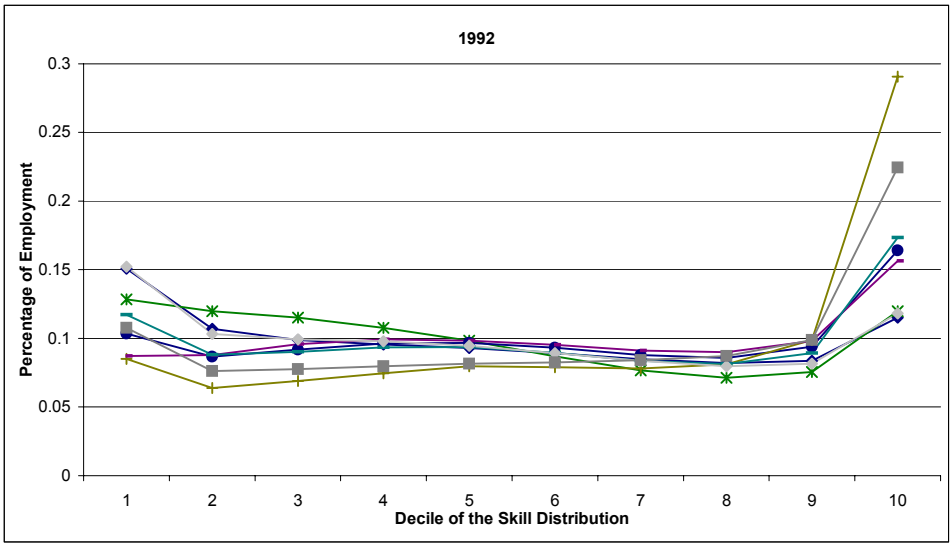
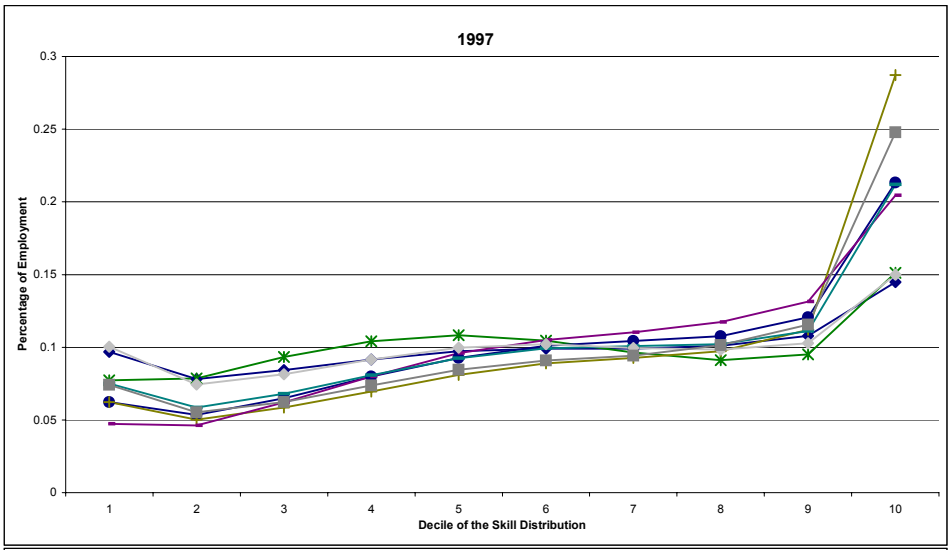


Figure 7A: Distribution of Human Capital for Finance, Insurance, and Real Estate





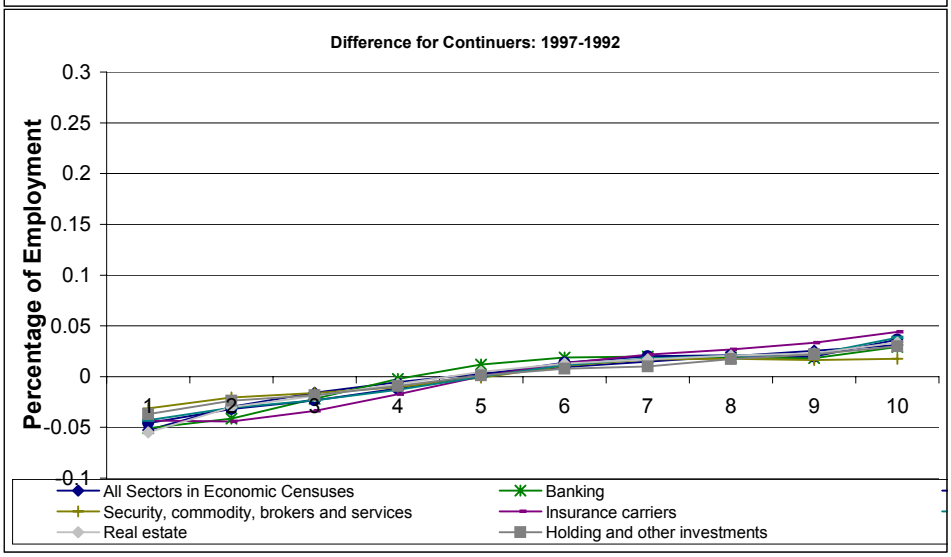


Figure 7B: Distribution of Human Capital for Finance, Insurance, and Real Estate

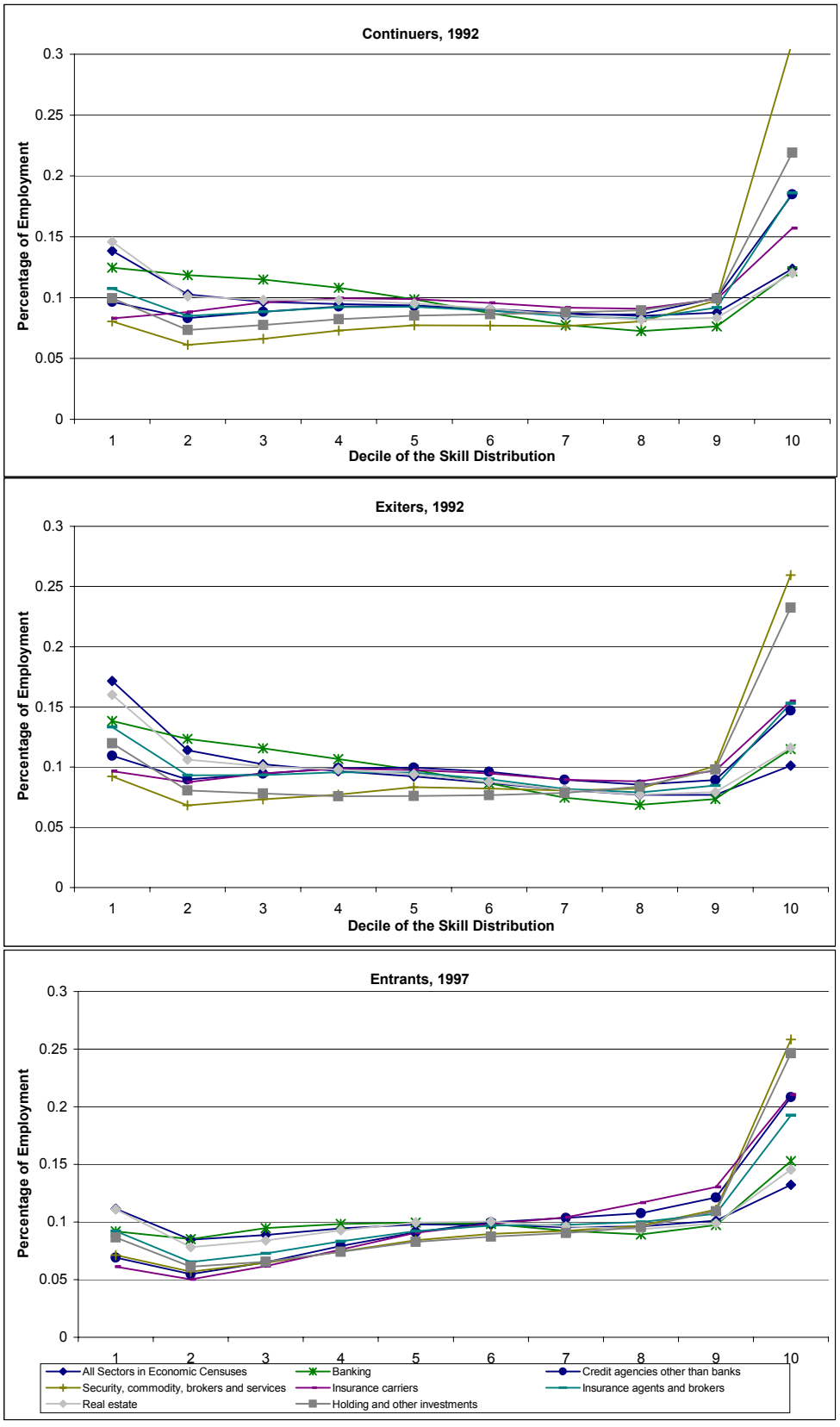


Figure 8A: Distribution of Human Capital for Services

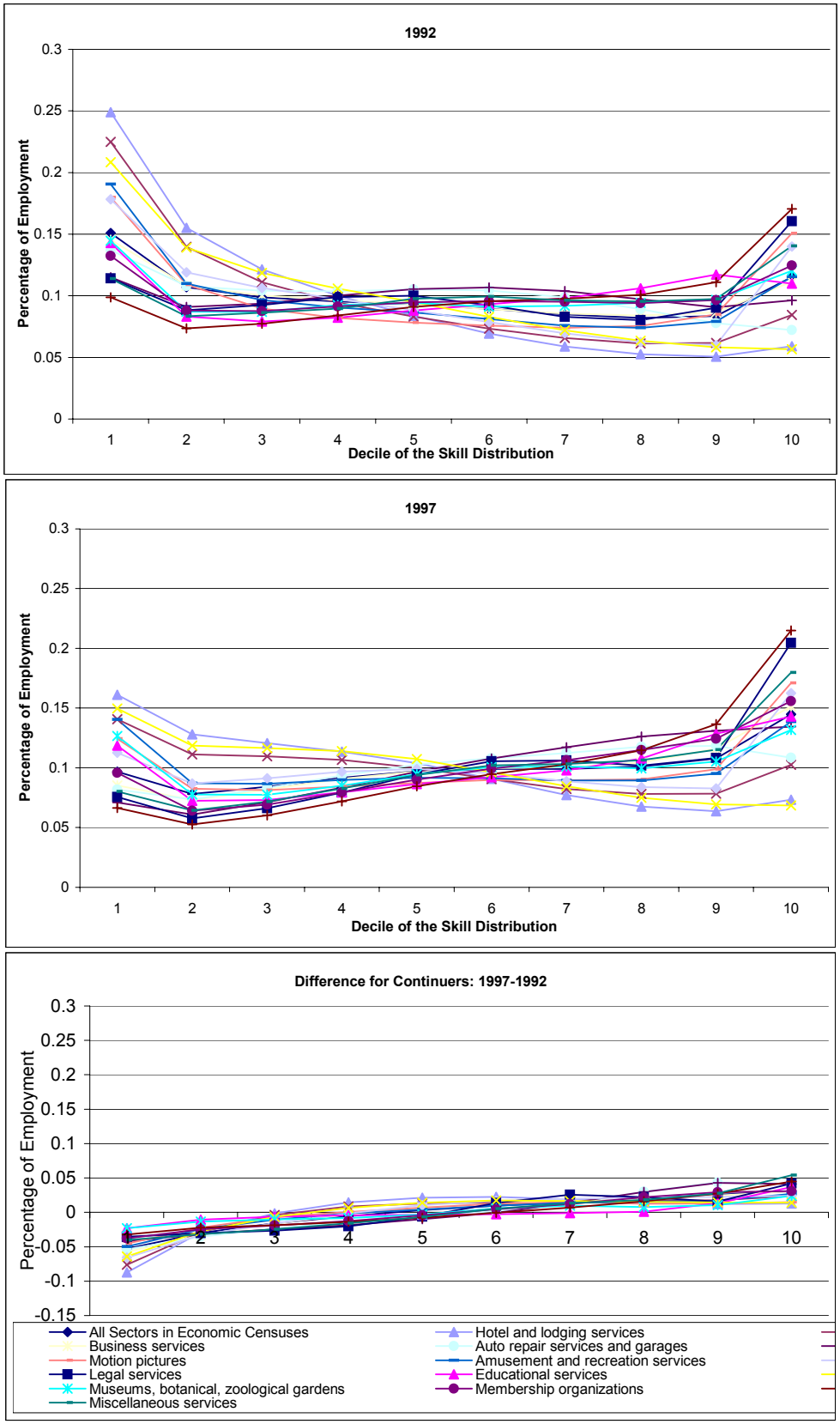


Figure 8B: Distribution of Human Capital for Services